Engineering Change Request Form

Change Request No.:	**Date:**	**WBS:**
1304-00137	9/30/2011	1.4.3.9
Control Account Name: 1.4.3.9 - Core Instrument Packages Development	**Configuration Manager:** McGuire, Chuck	**Control Account Manager:** Harrington, Mike

SECTION TO BE COMPLETED BY PERSON REQUESTING CHANGE:

Requestor: Chuck McGuire	**Telephone Number:** (206) 616-5834

Request Name (Include document number and revision level):
RSN Bottom Pressure Instrument (PREST) Waiver

Description of Change (Include all related systems):
A Waiver is requested to use the SeaBird Electronics, Inc SBE54 Pressure instrument as a core instrument for Basic Core Seafloor Measurements (BCSM) on the RSN network.
RSN procured the SBE54 Pressure instrument through a competitive Request For Proposal (RFP) process. While this instrument was chosen in accordance with an RSN Source Selection Plan utilizing a highly skilled Source Selection Evaluation Board meeting the competitive procurement requirements of Ocean Leadership and the University of Washington, it does not meet the following requirements:

* L4-RSN-IP-RQ-543 "The BCSM instrument for pressure sensing shall measure near bottom pressure with a drift of no more than 2 kPa (0.2 dbar) over a 12 month period."
In fact, the SE54 has a stated drift of 10.3 kPa over a 12 month period.

It is also noted that while the instrument does not meet the following two requirements simultaneously:
* L4-RSN-IP-RQ-99 "The BCSM instrument for pressure sensing shall measure near bottom pressure with a resolution of 4 Pa (0.04 mbar)."
* L4-RSN-IP-RQ-101 "The BCSM instrument for pressure sensing shall be capable of sampling at a frequency of 1 Hz."
The SBE54 is not capable of sampling at a frequency of 1 Hz with a resolution of 4 Pa. With a sample period of 18 sec, the SBE will obtain a resolution of 3.79 Pa. The resolution of the SBE54 at a sample frequency of 1 Hz is 68.3 Pa.

These L4 requirements are flow downs from the following L2 requirements, which will be waived as well:
* L2-SR-RQ-3159 (L4-RSN-IP-RQ-99)
* L2-SR-RQ-3325 (L4-RSN-IP-RQ-101)
* L2-SR-RQ-3707 (L4-RSN-IP-RQ-543)

This ECR is a Waiver Request submitted in accordance with the Procedure for Obtaining Waivers which resides in the Systems Engineering Process Library in Alfresco. A waiver is a specific written authorization to accept a product which departs from specified requirements, but nevertheless is considered suitable for use “as is” or after modification by an approved method. A waiver states that a requirement does not need to be satisfied in order to pass a test of the related product. Waivers are associated with particular products and do not modify the requirement(s) in question. The procurement Source Selection and Evaluation Boards (SSEB) are authorized to procure products which deviate from the approved requirements in order to achieve the best value for the program. This scope of this ECR is whether the item is acceptable and the Waiver should be granted; it does not include the SSEB process.

Reason for Change:
To allow the use of the SeaBird Electronics, Inc SBE54 Pressure Instrument even though it is not 100% compliant with the requirements for the BCSM instrument for pressure sensing in that L4-RSN-IP-RQ-543 will not be met and that L4 -RSN-IP-RQ-99 and L4-RSN-IP-RQ-101 can not be met in unison.
Furthermore, it must be noted that during the verification of requirements that the above requirements have been waived for this instrument.

There are currently no commercial instruments that specify drift although there are instruments in development designed to self-correct for drift. Drift will have to be measured on a long term basis and corrections applied based on those measured offsets. Per published papers, instruments will have to be carefully placed and left undisturbed for several years of measurements to determine a drift rate unique to each instrument. As a consequence, until the drift rate is known, geodetic measurements of pressure at the seafloor would result in a loss of very low frequency information that could signify subsidence or deflation/inflation (DI) and provide a critical measurement towards predicting major plate movement (e.g. earthquakes).

Benefit to OOI:
A best value instrument for bottom pressure sensing has been procured through a competitive process for the RSN network.

Requestor Assessment of Impact to Control Account:

Scope: No Change		
Schedule: No Change		
Cost: No Change		
SECTION TO BE COMPLETED BY IO/SL CCB CHAIRPERSON:		
Assessment of Impact to IO Project:		
Master Schedule: No Change		
Project Cost: No Change		
Deliverables: No Change		
Potential Impact to Science and Design / As-built Capability:		
Percent Impact on WBS elements(s) selected: 0%	**Percent Impact on OOI:** 0%	
Contingency $0	**Contingency Schedule (weeks):** 0	
Signature of RSN CCB Chairperson: Chuck McGuire (mcguire@apl.washington.edu)	**Date:** 9/30/2011 3:00:00 PM	**Board Determination:** Approved
Signature of System CCB Chairperson: Ed Chapman (echapman@oceanleadership.org)	**Date:** 3/15/2012 11:00:00 AM	**Board Determination:** Approved
CERTIFICATION OF TECHNICAL DATA PACKAGE AND CONTROL SYSTEM UPDATE		
Signature of Configuration Manager: Chuck McGuire (mcguire@apl.washington.edu)	**Date:** 4/13/2012 5:24:53 PM	**Systems and Documentation Updated:** Confirmed Complete
Attach supporting technical documentation and or additional comments as needed.		

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ECR Comments

#	Reviewer	Date Added	General Comment	Requestor Response	CCB Decision	Lien
1	Michael Zernick	10/6/2011	I'd like to see the minutes from whichever technical review verified requirements -99 and -101 and waived them. Furthermore, I would agree with granting the waiver with buy-in from those Project Scientists who would directly be deploying/using the equipment. After all, the SBE54 does not measure as precisely as stated in the three requirements referenced.	Reject		
2	Ed Chapman	10/7/2011	Recommend approval. Although this is the first waiver we've processed, it is being done in accordance with SE policy.	Accept		
3	Steve Ackleson	10/7/2011	Not having seen the proposal deliberations, I would like to know what "clear winner" means. Was this sensor judged relative to the other proposals or the project requirements? I would also like to understand how the sensor can perform without impact to L3 requirements while not meeting what seems to be important sensor requirements. Surely, there must be some impact on L3 requirements, however small. I would like to understand this tradeoff.	Accept		
4	David Ayers	10/11/2011	document reviewed - no comments	Accept		
5	Sheri White	10/11/2011	These three L4 RSN IP RQs correspond to the following L2 RQs which presumably should be waived as well: L2-SR-RQ-3707, L2-SR-RQ-3159, L2-SR-RQ-3325.	Accept		
6	Paul Matthias	10/14/2011	No additional comments.	Accept		
7	John Orcutt	10/16/2011	This a Sea-Bird instrument, which incorporates a Paroscientific DigiQuartz sensor and Sea-Bird markets the pressure sensor as a tsunami detector. As such, this measures, in this application, fairly high frequencies (e.g. 10mHz or more). The drift does limit the response at lower frequencies and the drift is well-documented in the literature - the drift can be either positive or negative. In addition, the oscillator used in the sensor drifts so that timing over a year can easily be off by more than 1s (either plus or minus). I don't believe that the science driver here is tsunami detection, but measuring low frequency variations in the water density - I don't know that this has been used for this application before, but the actual (scientific) application should be used to determine if the drift of both the clock and the pressure are acceptable for the application. At the moment there are no pressure sensors which are capable of measuring pressures below semidiurnal and diurnal tidal frequencies that don't drift in pressure or time. It is likely that such sensors will exist in two years' time, but not now.	Accept		
8	Susan Banahan	10/16/2011	It would be helpful to know if this waiver is supported by project scientists with knowledge/interest in the L2 requirements linked to this sensor's specifications.	Accept		

9	Al Plueddemann	10/16/2011	I agree with Sue Banahan's comment. From my perspective I don't see a significant impact. The drift will be evaluated and corrected to the extent possible. There is no known option that will do better. Recommend approval.	Accept		
10	John Orcutt	10/16/2011	Please note that the drift in pressure cannot be corrected (nor can the drift in clock time). The total clock drift can be measured on recovery, but this provides only the total error over the deployment period. The assumption can be made that the clock drift is linear although, in the past, this has been shown to be an inappropriate assumption. The quoted drift seems to be larger than that typically measured for the Paroscientific gauge. Typical drifts are on the order of 20 cm/yr while that quoted here is about 1m/yr.	Accept		
11	Paul Hagstrom	3/7/2012	Support approving waiver - it appears that instruments that meet our specification requirements do not currently exist.	Accept		
12	Ed Chapman	3/9/2012	I (still) recommend approval.	Accept		
13	Pete Barletto	3/13/2012	recommend approval	Accept		
14	Sheri White	3/14/2012	No further comments. Recommend approval.	Accept		
15	Bill Pritchett	3/14/2012	Recommend approval	Accept		
16	Michael Zernick	3/14/2012	Oh, OK! Recommend Approval.	Accept		
17	Susan Banahan	3/14/2012	Recommend approval.	Accept		
18	Greg Settle	3/15/2012	Recommend approval	Accept		

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ECR Vote (Highest Level Board: System)

Title	Member Name	Delegate Name	Vote	Comment
Senior Project Scientist	Steve Ackleson		Approve	
Project Manager	Matthew Arrott		Approve	
EHS Manager	David Ayers		Approve	
Associate Program Director	Susan Banahan		Approve	
Project Manager	Pete Barletto		Approve	
COTR - Associate Project Manager CG	Mark Bittenbender		Approve	
Chief Systems Engineer	Ed Chapman		Approve	
Former teammate	Alan Chave		Approve	
OOI Program Director/PI	Tim Cowles		Approve	
Project Manager	Mike Crowley		Approve	
Program Director/PI	John Delaney		Approve	
Senior Project Manager, Advisor	Anthony Ferlaino		(Did Not Vote)	
Principal Investigator	Scott Glenn	Mike Crowley	Approve	
COTR - Associate Project Manager RSN	Paul Hagstrom		Approve	
Project Scientist	Deb Kelley	Pete Barletto	Approve	
Program Manager and Chief Engineer	Paul Matthias		Approve	
COTR - Associate Project Manager EPE	Andrea McCurdy		Approve	
Senior Systems Engineer	Chuck McGuire		Approve	
Principal Investigator for CI	John Orcutt		Approve	
Project Scientist	Al Plueddemann		Approve	
COTR - Associate Project Manager CI	Bill Pritchett	Mark Bittenbender	Approve	
CGSN and EA COTR	Greg Settle		Approve	
EV Consultant	Steve Stratton		Approve	
Co-Principal Investigator	John Trowbridge		Approve	
Deputy Principal Investigator	Frank Vernon		Approve	
Program Director/PI	Bob Weller	John Trowbridge	Approve	

Lead System Engineer	Sheri White		Approve	
System Engineer	Joe Wieclawek		Approve	
Quality & Safety Manager	Michael Zernick		Approve	

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ECR Liens/Action Items

Lien	Due Date	Complete	Completion Date

Action Item	Due Date	Complete	Cancel	Completion Date
Mark the Verification Status for the L4 requirements as “Waived” in DOORS.	4/20/2012	Yes	No	4/13/2012
Update “Approved Waiver-CM” attribute for affected L2 requirement (s) in DOORS with the ECR number of the approved Waiver and a description of the affected product.	4/20/2012	Yes	No	4/2/2012
Update “Approved Waiver-CM” attribute for affected L4 requirement (s) in DOORS with the ECR number of the approved Waiver and a description of the affected product.	4/20/2012	Yes	No	4/13/2012
Baseline L2 Science Requirements module	4/25/2012	Yes	No	4/13/2012
Baseline L4 RSN Instrument Package module	4/25/2012	Yes	No	4/13/2012
Export updated L2 Science Requirements spreadsheet and post in Alfresco	4/25/2012	Yes	No	4/13/2012
Export updated L4 RSN Instrument Package spreadsheet and post in Alfresco	4/25/2012	Yes	No	4/13/2012
Update L2 Science Requirements module	4/25/2012	Yes	No	4/11/2012
Update L4 RSN Instrument Package module	4/25/2012	Yes	No	4/13/2012

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ECR Meeting Results and Notes

Board Level	Meeting Date	Meeting Name	Meeting Result	Meeting Notes
RSN	9/30/2011	Tech Spec Round Up	Approved	
System	3/15/2012	2012-03-15 System Level CCB	Approved	