

Office of Ocean Exploration and Research

Program Review

October 2019

OER Response to Panel Summary Recommendations

April 26, 2021

Submitted by:

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Introduction

On 16 – 18 October 2019, a panel of independent reviewers was assembled to assess the NOAA Office of Ocean Exploration and Research (OER). Reviewers were charged to: 1) review the quality, relevance, and performance of OER over the previous five year period of operations and 2) assess the strategic positioning of OER going forward. Each reviewer's discrete submissions were compiled into a summary report that was organized across the four goals described in OER's current strategic plan:

- Ocean Exploration: Mapping and Characterization
- Technology: Development, Application, and Program Use
- Data and Information: Availability and Access
- Engagement: Reaching the Public

[The Summary Report](#) is highly complementary to OER and praised the Program for meaningful successes throughout the review period. The Summary Report provided 10 findings and 22 recommendations that cover a broad range of issues and topics. A small number of themes, however, repeatedly emerged across the summary report.

- 1) OER's ability to acquire and secure ship time and observation platforms for the ocean exploration mission;
- 2) OER's leadership role in developing policy, technology standards, and strategic objectives for the National-level ocean exploration community;
- 3) Redefining the role of data within the ocean exploration community; and
- 4) OER as a champion for modernization efforts across the entire enterprise.

The following document is OER's written response to the recommendations contained in the summary report. Each actionable recommendation provided by the Program Review Panel is italicized and followed by the OER response. A table summarizing the actions with timelines for completion is included below. Detailed responses can be found in the Appendix.

Recommendations, Responses, and Action Plans

FMC Review Action Sheet				
Recommendation	Action	Champion	Target start & Completion Dates	Status/Notes
Set a Path Forward for Ship Access	OER is currently developing an Exploration Strategy to define exploration priorities and outline the methods, platforms, and technologies that the Program will use to meet mission objectives over the next five years.	Rachel Medley	Q3, 2021	
	OER is developing, based upon the findings and recommendations of this Program Review, a new five-year strategic plan to define mission objectives and inform resource allocation decisions.	Gene Fisher	Q1, 2022	

Coordinate information and gap-fill across the combined U.S. fleet.	OER is developing a Deepwater Exploration Mapping Procedures Manual to encourage operational consistency within the Program. Upon completion, the product could be shared as a best practice.	Rachel Medley	Q3, 2020	
	OER is currently developing an Exploration Strategy to define exploration priorities and outline the methods, platforms, and technologies that the Program will use to meet mission objectives over the next five years.	Rachel Medley	Q3, 2021	
	OER is currently developing a Remotely Operated Vehicle (ROV) and Telepresence Deep Water Exploration Procedures Manual to encourage operational consistency. Upon completion, the product could be shared as a best practice.	Rachel Medley	Q4, 2021	
	OER is currently developing a Spatial Definition of Exploration document which, among other things, will inform the identification of data gaps in the collection process. Upon completion, the product could be shared as a best practice.	Frank Cantelas	Q4, 2021	

Explore New Approaches with a Higher Risk Profile	OER will develop an easy to use risk assessment tool that will be used by proposal reviewers to quantify the risk profile of potential projects.	Frank Cantelas	Q1, 2022	
Identify Goals and a Strategy for a National Program of Ocean Exploration	OER, through its leadership roles on the NOMECC Council and the Interagency Working Group on Ocean Exploration and Characterization, will support the development of an Implementation Plan to identify specific actions that describe how the goals, objectives, and associated timelines presented in the National Strategy will be accomplished.	Rachel Medley	Q2, 2021	
Take advantage of emerging technology	OER will develop a Technology Roadmap to guide internal deliberations and priority setting regarding acquisitions, grant agreements, and project selection	Frank Cantelas	Q4, 2021	
	OER will collaborate with its partners and stakeholders to develop a concept of operations for an asset survey of the federal ocean exploration community to better understand the current technology capacity in use across the enterprise	Frank Cantelas	Q3, 2022	

	OER will develop a concept of operations for conducting a life-cycle analysis of its ROV assets	Rachel Medley	Q4, 2021	in the contract. part of annual management process via the cooperative agreement w/ GFOE
Identify those techniques and strategies that enable the ocean to be observed remotely	As directed through the CENOTE Act of 2018, OER will work with the NOAA UxS Executive Oversight Board and the OMAO UxS Operations Center to better understand the range of capabilities that are available to support ocean exploration and scientific activities.	Frank Cantelas	Q4, 2021	
	OER is developing multiple products that will provide guidance and standards for deepwater operations using autonomous and uncrewed systems; examples include the Deepwater Exploration Mapping Procedures Manual the Telepresence Deep Water Exploration Procedures Manual; and the Technology Roadmap.	Frank Cantelas	Q4, 2021	reflects other activities
	OER is currently supporting technology demonstration projects that explore innovations in Telepresence and remotely operated and autonomous platforms.	Frank Cantelas	Q4, 2021	this is a count of UxS tech demonstrations

	OER is adjusting its operational portfolio to encourage an increase of information from uncrewed systems and has developed an annual performance measure “Annual number of UxS executed days at sea (DAS) funded by OER” to better track and understand the mix of uncrewed missions in the OER portfolio.	Rachel Medley	Q4, 2021	on going measure; tracked by Aurora Elmore (CI manager)
Identify talent and innovation to solve today’s ocean exploration problems	OER will use the Ocean Exploration Cooperative Institute (OECI) as a source for talent and capabilities necessary to tackle highly ambitious challenges.	Frank Cantelas	Q4, 2022	this is a count of projects funded through its funding and support mechanisms
Develop a Formal Mechanism for Evaluating Exploration Architectures	OER, through its participation on the National Ocean Mapping, Exploration, and Characterization Council (NOMECC), is contributing to the IWG-OCM’s effort to develop a Standard Ocean Mapping Protocol that will ensure consistent technical standards for mapping, conducted in support of the National Strategy, will be broadly applicable.	Rachel Medley	Q3, 2021	will be complete in FY2021
	OER, through its participation on the NOMECC will contribute to interagency efforts to establish a suite of standards and protocols for exploration and characterization that will meet the information needs of agency requirements.	Rachel Medley	Q3, 2022	target for completion is FY 2022

Dissolve data discovery stovepipes	OER, through its leadership role on the NOMECEC will contribute to its strategic milestone 2.3.1 "Inventory, promote, and utilize centralized national repositories, data portals, and clearinghouses for OCM data management, access, synthesis, and archival".	Rachel Medley	Q4 2021	once developed, this will be an ongoing activity
	OER, through its leadership role on the NOMECEC, will contribute to its strategic milestone 2.3.2 "Evaluate Federal agency mapping data holdings to ensure adherence to open data delivery commitments (formats, metadata, archive, and accessibility) to enhance interoperability".	Rachel Medley	Q4, 2021	once developed, this will be an ongoing activity
	OER will finalize its Exploration Variables Tech Memo to identify data gaps in ocean exploration operations for OER to determine how to best address them moving forward.	Frank Cantelas	Q3, 2021	heading to publication
	OER will solicit community input about the discoverability and accessibility of its data holdings to better understand how people find and retrieve those data.	Rachel Medley	Q1, 2022	ongoing; potential topic for COL forum 2021 (Q4)
Improve Searchability and Accessibility of Video Data	OER will solicit community input about the discoverability and accessibility of its data holdings to better understand how people find and retrieve those data.	Rachel Medley	Q1, 2022	ongoing; potential topic for COL forum 2021 (Q4)

	OER will continue to collaborate with CVISION AI as part of NOAA SBIR project to develop an AI enabled cloud-based video playback tool (Tator) and to develop training data sets to aid AI enabled annotations.	Rachel Medley	Q3, 2021	Phase I is complete, moving into Phase II of the project
Develop a Strategy to Accommodate a Significant Increase in Data Volume	OER will develop a data principles document that will incorporate NOAA and OAR guidance and directives into an Office-level plan. This document will establish functional goals for OER's data management approach and will define the functional IT requirements necessary to support the Program's mission objectives.	Rachel Medley	Q4, 2022	FY22 milestone for data principles
Strategically position OER to fully realize the value of its data	OER will develop a data principles document that will incorporate NOAA and OAR guidance and directives into an Office-level plan. This document will establish functional goals for OER's data management approach and will define the IT requirements necessary to support the Program's mission objective	Rachel Medley	Q4, 2022	FY22 milestone for data principles
	OER will conduct an internal audit of the terms and conditions in contracts, cooperative agreements, and grants related to data and intellectual property rights to ensure that OER data assets are open and available to the widest possible audience.	Tamara Lewis	Q1, 2022	

	OER is committed to the principles described in NOAA's Public Access to Research Results (PARR) plan and currently works to ensure that data from cooperative institutes and other OER-funded partners must be made publicly available and interoperable with other NOAA data. OER will launch a review process to ensure its funded partners are in compliance with that standard.	Genene Fisher	ongoing	This is a count of demonstrations that are run through OECI cooperative institute
Accelerate Telepresence Deployment with Low-Cost Pilots	OER will use its funding and support tools (FFOs, CRADAs, Cooperative Agreements, NOPP agreements, STTR, SBIR, etc) and specifically its relationship with the Ocean Exploration Cooperative Institute (OECI) to highlight low-cost telepresence capabilities enabled by cloud computing or commercially available satellite internet capacity.	Rachel Medley	Q3, 2022	
Invest in Data Leadership and Harmonization	OER is committed to the principles described in NOAA's Public Access to Research Results (PARR) plan and currently works to ensure that data from cooperative institutes and other OER-funded partners must be made publicly available and interoperable with other NOAA data. OER will launch a review process to ensure its funded partners are in compliance with that standard.	Genene Fisher	Q3, 2022	IWG-OEC standards and protocols

	OER, through its participation on the NOMECE will contribute to interagency efforts to establish a suite of standards and protocols for exploration and characterization that will meet the information needs of agency requirements	Rachel Medley	Q4, 2022	data management plans for EX cruises
Create a Standardized Template for Baseline Site Descriptions	OER will provide standardized data reporting and sharing best practices with the community	Rachel Medley	Q4, 2022	ocean mapping procedures manual and ROV/Telepresence manual
Support the development of artificial intelligence and machine learning tools	OER will use its funding and support tools (FFOs, CRADAs, Cooperative Agreements, NOPP agreements, STTR, SBIR, etc) to encourage innovative AI and ML capabilities for the classification and exploration of ocean exploration data.	Rachel Medley	Q3, 2023	
Produce a master remotely operated vehicle sensor and position reference file	OER will develop a concept of operations for a ROV sensor and position reference tool to determine the approach, the level-of-effort, and the costs for such a project. This effort will contribute to the long term evolution to shore-side operations management and coordination.	Rachel Medley	Q4,2024	
Build In-house Data Science Capability	OER will determine the feasibility of designating a Chief Data Officer to oversee and coordinate all of OER's overlapping data related projects and initiatives.	Genevieve Fisher	Q4,2022	

	<p>OER will develop a OER data principles document that will incorporate NOAA and OAR guidance and directives into a local-level plan. This document will establish functional goals for OER’s data management approach and will define the IT requirements necessary to support the Program’s mission objectives.</p>	Rachel Medley	Q4, 2022	FY22 milestone for data principles
“Make Oceans matter” to the public	<p>OER will conduct an evaluation of its outreach products and audiences, including members of the general public, in order to refine the office’s messaging and product development approach to better engage the public and raise the visibility of the importance of the ocean and ocean exploration.</p>	Kristen Crossett	Q4, 2022	
	<p>OER, in collaboration with its partners, will support the creation of a consolidated online “one-stop-shop” for education professionals and members of the public to easily access high-quality ocean exploration educational resources and other materials.</p>	Kristen Crossett	Q4, 2022	
	<p>OER will increase the opportunities for all audiences to participate in telepresence-enabled ocean exploration expeditions.</p>	Kristen Crossett	Q2, 2022	

Improving media and other outreach products to allow greater accessibility to the broader public	OER will develop a strategic communications plan to guide and inform the Program’s external communications and outreach efforts to the general public, academia, industry, and other government agencies.	Kristen Crossett	Q4, 2021	
	OER will conduct an evaluation of its audiences and current outreach products to better understand whether target audiences are consuming those products and whether improvements can be made to be most effective at communicating the Program’s messages.	Kristen Crossett	Q2, 2021	complete
	OER will develop a strategy to enhance videos produced using OER imagery to tell the story of the value and importance of ocean exploration and OER’s role.	Kristen Crossett	Q2, 2022	
Build on Partnerships	OER will conduct a comprehensive inventory of its existing partners and stakeholders.	Kristen Crossett	Q3, 2022	
	OER will conduct a gap analysis of its current stakeholder portfolio, set engagement priorities, and identify outreach targets.	Kristen Crossett	Q4, 2022	

	OER will increase the number of Educator Professional Development partners, with an emphasis on non-coastal and underserved communities and locations.	Kristen Crossett	Q4, 2022	
	OER will increase the number of student development opportunities by maximizing the use of internships, fellowship, and other student engagement programs.	Kristen Crossett	Q4, 2022	

Appendix

Instructions: Please have recommendations listed in the order that they appear in the “Summary of Recommendations” section of the review report.

Recommendations (GR)

R1: Set a Path Forward for Ship Access

R1 Response: OER concurs with this recommendation. It is important to note that at the time of the Program Review (Oct. 2019) NOAA Ship *Okeanos Explorer* was slated for end-of-life lay-up by 2025 which created an operational imperative for OER to secure ship time and days-at-sea. Since that time, however, several developments have occurred that changed the conditions associated with this recommendation. First, the end of life for *Okeanos Explorer* has been extended by several years and second, NOAA has committed to providing OER with a new ship, *Discoverer*, which will be online around 2025. These two events meaningfully reduced the immediate risk of a compromised operational capability the Program was considering in the Fall of 2019. OER is currently developing both a new five-year strategic plan and a focused Exploration Strategy to guide operations planning, budget decisions, and investment opportunities.

Action Plan:

1. Action: OER is currently developing an Exploration Strategy to define exploration priorities and outline the methods, platforms, and technologies that will be used to meet mission objectives over the next five years.
2. Action: OER is developing, based upon the findings and recommendations of this Program Review, a new five-year strategic plan to define mission objectives and inform resource allocation decisions.

R2: Coordinate information and gap-fill across the combined U.S. fleet.

Response: OER concurs with the intent of this recommendation. A clear identification and understanding of priorities, plans, and performance targets across the ocean exploration community would be highly valuable. However, OER is not in a position to assume that responsibility for the combined fleet. OER, through its leadership role on the National Ocean Mapping, Exploration, and Characterization Council, will continue collaborating with its partners, coordinating multi-organizational campaigns and explorations, and sharing strategic goals, objectives, and performance targets.

Action Plan:

1. Action: OER is developing a Deepwater Exploration Mapping Procedures Manual to encourage operational consistency within the Program. Upon completion, the product could be shared as a best practice.
2. Action: OER is currently developing an Exploration Strategy to define exploration priorities and outline the methods, platforms, and technologies that

the Program will use to meet mission objectives over the next five years. Upon completion, the product could be shared with partners and collaborators.

3. Action: OER is currently developing a Remotely Operated Vehicle (ROV) and Telepresence Deep Water Exploration Procedures Manual to encourage operational consistency. Upon completion, the product could be shared as a best practice.
4. Action: OER is currently developing a Spatial Definition of Exploration document which, among other things, will inform the identification of data gaps in the collection process. Upon completion, the product could be shared as a best practice.

R3: Explore New Approaches with a Higher Risk Profile

Response: OER concurs with this recommendation. OER has a long track record of supporting emerging and innovative technologies to enhance ocean exploration capabilities through opportunities like the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, Federal Funding Opportunities (grants) and contracts with small and mid-sized companies. These can be highly effective tools for spurring innovation and encouraging fresh approaches for addressing OER's challenges. Defining a specific problem or question to be answered in a solicitation will encourage creative and inventive proposals from the business and academic communities.

Action Plan:

1. Action: OER will develop an easy to use risk assessment tool that will be used by proposal reviewers to quantify the risk profile of potential projects.

R4: Identify Goals and a Strategy for a National Program of Ocean Exploration

Response: OER concurs with intent of the recommendation, however, the release of the NATIONAL STRATEGY FOR MAPPING, EXPLORING, AND CHARACTERIZING THE UNITED STATES EXCLUSIVE ECONOMIC ZONE in June 2020 has largely filled this gap. OER will continue to provide leadership and support to the community in pursuit of the goals and objectives defined in the National Strategy.

Action Plan:

1. Action: OER, through its leadership roles on the NOMECE Council and the Interagency Working Group on Ocean Exploration and Characterization, will support the development of an Implementation Plan to identify specific actions that describe how the goals, objectives, and associated timelines presented in the National Strategy will be accomplished.

R5: Take advantage of emerging technology

Response: OER concurs with this recommendation. The pace of technology refresh, within the ocean science community, is unprecedented and reflects meaningful increases in exploration capabilities. A significant challenge is simply maintaining a functional awareness of the full range of technological innovations and improvements that seem to

appear on an almost daily basis. OER is fortunate to maintain an extensive alliance of partnerships with organizations like the Marine Technology Society who can provide a deep understanding of the marine technology industry. OER will actively engage with its partners to better understand the emerging capabilities and identify opportunities to incorporate them into exploration activities.

Action Plan:

1. Action: OER will develop a Technology Roadmap to guide internal deliberations and priority setting regarding acquisitions, grant agreements, and project selection.
2. Action: OER will collaborate with its partners and stakeholders to develop a concept of operations for an asset survey of the federal ocean exploration community to better understand the current technology capacity in use across the enterprise.
3. Action: OER will develop a concept of operations for conducting a life-cycle analysis of its ROV assets.

R6: Identify those techniques and strategies that enable the ocean to be observed remotely

Response: OER concurs with the recommendation. Uncrewed systems, such as remotely operated vehicles or uncrewed underwater vehicles, have tremendous potential to meaningfully expand OER's capacity to conduct ocean exploration activities. OER is committed to using and promoting the use of those innovative technologies to meet its own highly ambitious targets.

Action Plan:

1. Action: As directed through the CENOTE Act of 2018, OER will work with the NOAA UxS Executive Oversight Board and the OMAO UxS Operations Center to better understand the range of capabilities that are available to support ocean exploration and scientific activities..
2. Action: OER is developing multiple products that will provide guidance and standards for deepwater operations using autonomous and uncrewed systems; examples include the Deepwater Exploration Mapping Procedures Manual the Telepresence Deep Water Exploration Procedures Manual; and the Technology Roadmap.
3. Action: OER is currently supporting technology demonstration projects that explore innovations in Telepresence and remotely operated and autonomous platforms.
4. Action: OER is adjusting its operational portfolio to encourage an increase of information from uncrewed systems and has developed an annual performance measure "Annual number of UxS executed days at sea (DAS) funded by OER" to better track and understand the mix of uncrewed missions in the OER portfolio.

R7: Identify talent and innovation to solve today's ocean exploration problems

Response: OER concurs with this recommendation and will continue with its tradition of supporting cutting-edge small business and academic research and development focused on ocean science.

Action Plan:

1. Action: OER will use the Ocean Exploration Cooperative Institute (OECI) as a source for talent and capabilities necessary to tackle highly ambitious challenges.

R8: Develop a Formal Mechanism for Evaluating Exploration Architectures

Response: OER concurs with this recommendation and will continue participating in the interagency community to determine evaluation criteria for new and innovative technologies and their impact on ocean science.

Action Plan:

1. Action: OER, through its participation on the NOMECS, is contributing to the development of a Standard Ocean Mapping Protocol to ensure that the technical standards for mapping conducted in support of the National Strategy will be broadly applicable.
2. Action: OER, through its participation on the NOMECS Council will contribute to interagency efforts to establish a suite of standards and protocols for exploration and characterization that will meet the information needs of agency requirements.

R9: Dissolve data discovery stovepipes

Response: OER concurs with this recommendation. Internally, OER has a great deal of latitude in addressing its own data stovepipe issues and has embraced an approach that identifies gaps in its data landscape to focus attention on areas of improvement. The Exploration Variables Technical Memo will directly consider gaps in OER's ocean exploration operations. OER does not have the authority to directly control how other federal agencies, academic institutions, private sector businesses, or nonprofit organizations approach this problem. However, OER enjoys a prominent leadership role within that community and will use its platform to encourage and influence the collective integration of datasets through existing agreements and partnerships.

Action Plan:

1. Action: OER, through its leadership role on the NOMECS Council, will contribute to its strategic milestone 2.3.1 "Inventory, promote, and utilize centralized national repositories, data portals, and clearinghouses for OCM data management, access, synthesis, and archival"
2. Action: OER, through its leadership role on the NOMECS Council, will contribute to its strategic milestones 2.3.2 "Evaluate Federal agency mapping data holdings to ensure adherence to open data delivery commitments (formats, metadata, archive, and accessibility) to enhance interoperability".
3. Action: OER will finalize its Exploration Variables Tech Memo to identify data gaps in ocean exploration operations for OER to determine how to best address them moving forward.

4. Action: OER will solicit community input about the discoverability and accessibility of its data holdings to better understand how people find and retrieve those data.

R10: Improve Searchability and Accessibility of Video Data

Response: OER concurs with this recommendation. As noted in the summary report, OER has been recognized as a leader for developing and deploying “a system for searchable and discoverable archive of video clips leveraging rich metadata curated by the program.” OER’s relationship with Ocean Networks Canada (ONC) has enabled it to implement SeaTube, a web-based annotation interface for ROV operations for expeditions aboard NOAA Ship Okeanos Explorer. This is a powerful tool, however, there are limitations associated with the availability of subject metadata. The technological capability to expand this service to other than NOAA Ship Okeanos Explorer exists; the questions for consideration are about the capacity of the existing data infrastructure to carry that additional load; the interoperability of those data with other datasets; and the programmatic costs associated with offering that service. OER will work with ONC and NCEI to study the question and make a determination about the feasibility offering this type of data product.

Action Plan:

1. Action: OER will solicit community input about the discoverability and accessibility of its data holdings to better understand how people find and retrieve those data.
2. Action: OER will continue to collaborate with CVISION AI as part of NOAA SBIR project to develop an AI enabled cloud-based video playback tool (Tator) and to develop training data sets to aid AI enabled annotations.

R11: Develop a Strategy¹ to Accommodate a Significant Increase in Data Volume

Response: OER concurs with this recommendation. The volume of data being generated and disseminated by OER and its partners and stakeholders is increasing at an unprecedented rate. OER’s current data infrastructure is insufficient to keep pace with this increase. OER has an opportunity to consider the role data will play within its mission space and to define its specific IT and data management requirements.

Action Plan:

1. Action: OER will develop a data principles document that will incorporate NOAA and OAR guidance and directives into an Office-level plan. This document will establish functional goals for OER’s data management approach and will define the functional IT requirements necessary to support the Program’s mission objectives.

R12: Strategically position OER to fully realize the value of its data

¹ NOAA released an enterprise level [data strategy](#) in July of 2020.

Response: OER concurs with this recommendation. Data is a critical strategic asset and OER is committed to effectively managing it.

Action Plan:

1. Action: OER will develop a data principles document that will incorporate NOAA and OAR guidance and directives into an Office-level plan. This document will establish functional goals for OER's data management approach and will define the IT requirements necessary to support the Program's mission objective
2. Action: OER will conduct an internal audit of the terms and conditions in contracts, cooperative agreements, and grants related to data and intellectual property rights to ensure that OER data assets are open and available to the widest possible audience.
3. Action: OER is committed to the principles described in NOAA's Public Access to Research Results (PARR) plan and currently works to ensure that data from cooperative institutes and other OER-funded partners must be made publicly available and interoperable with other NOAA data. OER will launch a review process to ensure its funded partners are in compliance with that standard.

R13: Accelerate Telepresence Deployment with Low-Cost Pilots

Response: OER concurs with this recommendation. Telepresence capabilities are heavily dependent upon access to a reliable broadband infrastructure. Determining performance requirements and securing bandwidth are as important as the technological engineering of a piece of hardware. OER, through its active partnership with the Ocean Exploration Cooperative Institute (OECI), will continue supporting the evolution of affordable, reliable, and high-quality telepresence capabilities as a means to expand ocean exploration opportunities.

Action Plan:

1. Action: OER will use its funding and support tools (FFOs, CRADAs, Cooperative Agreements, NOPP agreements, STTR, SBIR, etc) and specifically its relationship with the Ocean Exploration Cooperative Institute (OECI) to highlight low-cost telepresence capabilities enabled by cloud computing or commercially available satellite internet capacity.

R14: Invest in Data Leadership and Harmonization

Response: OER concurs with this recommendation. At the heart of this recommendation is a question of data interoperability. Ideally, data collected from the Okeanos or other OER-supported platforms would be interoperable with data collected from any other source in the ocean exploration community.

Action Plan:

1. Action: OER is committed to the principles described in NOAA's Public Access to Research Results (PARR) plan and currently works to ensure that data from cooperative institutes and other OER-funded partners must be made publicly

available and interoperable with other NOAA data. OER will launch a review process to ensure its funded partners are in compliance with that standard.

2. Action: OER, through its role on the NOMECS will contribute to developing common data architectures, repositories, and stewardship requirements.

R15: Create a Standardized Template for Baseline Site Descriptions

Response: OER concurs with this recommendation. Real-time site and campaign descriptions may not be feasible given current operational constraints, however, OER is committed to ensuring that all quality controlled data are reported to the NOAA data archive within 90 days of a completed cruise. OER recognizes the value of data templates and currently employs several for a variety of internal reporting purposes. Those examples can be shared as best practices.

Action Plan:

1. Action: OER will ensure standardized data reporting templates are consistently used for internal purposes.
2. Action: OER will share standardized data templates as a best practice.

R16: Support the development of artificial intelligence and machine learning tools

Response: OER concurs with the intent of this recommendation. Artificial intelligence (AI) and machine learning (ML) capabilities are revolutionizing data management and analysis across nearly every industrial and academic sector. AI and ML tools could offer researchers an invaluable resource for managing, structuring, and analyzing the vast amounts of ocean exploration and scientific data that are generated daily. OER will explore options for supporting the development and evolution of those capabilities and will determine the most appropriate path forward for the program.

Action Plan:

1. Action: OER will use its funding and support tools (FFOs, CRADAs, Cooperative Agreements, NOPP agreements, STTR, SBIR, etc) to encourage innovative AI and ML capabilities for the classification and exploration of ocean exploration data.

R17: Produce a master remotely operated vehicle sensor and position reference file

Response: OER concurs with this recommendation. OER will explore options for developing such a tool and determine its feasibility.

Action Plan:

1. Action: OER will develop a concept of operations for a ROV sensor and position reference tool to determine the approach, the level-of-effort, and the costs for such a project. This effort will contribute to the long term evolution to shore-side operations management and coordination.

R18: Build In-house Data Science Capability

Response: OER concurs with the intent of this recommendation. OER will develop a data principles document to guide data integration across the Program. Building an in-house data science capability within OER is a consequential decision that will require thoughtful consideration and extensive additional resources.

Action Plan:

1. Action: OER will determine the feasibility of designating a Chief Data Officer to oversee and coordinate all of OER’s overlapping data related projects and initiatives.
2. Action: OER will develop a OER data principles document that will incorporate NOAA and OAR guidance and directives into a local-level plan. This document will establish functional goals for OER’s data management approach and will define the IT requirements necessary to support the Program’s mission objectives.

R19: “Make Oceans matter” to the public

Response: OER concurs with the intent of this recommendation. There is undeniable value in exposing the general public to ocean science and exploration topics. OER is mandated to conduct “outreach and education programs to improve public understanding of ocean and coastal resources” by its [authorizing legislation](#), but as a small program, it must be judicious with its investments. Members of the ocean-interested general public are a primary target audience for OER outreach products, and OER remains committed to exploring new ways to engage this audience on topics of ocean science and exploration, including through the use of traditional media, online communication tools, and telepresence. Additionally, education professionals are a key audience for OER engagement, precisely because they offer the means to introduce the ideas, the concepts, and the excitement of ocean exploration to students across the Nation.

Action Plan:

1. Action: OER will conduct an evaluation of its outreach products and audiences, including members of the general public, in order to refine the office’s messaging and product development approach to better engage the public and raise the visibility of the importance of the ocean and ocean exploration.
2. Action: OER, in collaboration with its partners, will support the creation of a consolidated online “one-stop-shop” for education professionals and members of the public to easily access high-quality ocean exploration educational resources and other materials.
3. Action: OER will increase the opportunities for all audiences to participate in telepresence-enabled ocean exploration expeditions.

R20: Improving media and other outreach products to allow greater accessibility to the broader public

Response: OER concurs with this recommendation. OER has enjoyed tremendous success tailoring its science-based outreach and communication products to the ocean science and exploration communities. OER’s leadership role, however, requires that it produce clear impactful information that is easily understood and that can describe the

benefits and achievements of the program to a wide range of audiences. OER understands its outreach and communications capabilities to be a strategic asset and it will 1) develop a comprehensive approach to outreach and messaging that reflects the full scope of the Program's operations; 2) work to better understand the effectiveness of its current outreach products; and 3) explore the tools and platforms available to enhance OER's ability to tell its story.

Action Plan:

1. Action: OER will develop a strategic communications plan to guide and inform the Program's external communications and outreach efforts to the general public, academia, industry, and other government agencies.
2. Action: OER will conduct an evaluation of its audiences and current outreach products to better understand whether target audiences are consuming those products and whether improvements can be made to be most effective at communicating the Program's messages.
3. Action: OER will develop a strategy to enhance videos produced using OER imagery to tell the story of the value and importance of ocean exploration and OER's role.

R22: Build on Partnerships

Response: OER concurs with the recommendation. As a small program, with limited resources, it would be impossible to achieve many of its highly ambitious mission objectives without an effective and broad network of partners and stakeholders. OER's enthusiasm for collaboration has been a core principle of the Program since its inception and has resulted in dozens of formal institutional relationships and hundreds of informal peer-to-peer associations. OER will undertake a partnership mapping exercise to identify underserved areas that can be targeted for future engagements.

Action Plan:

1. Action: OER will conduct a comprehensive inventory of its existing partners and stakeholders.
2. Action: OER will conduct a gap analysis of its current stakeholder portfolio, set engagement priorities, and identify outreach targets.
3. Action: OER will increase the number of Educator Professional Development partners, with an emphasis on non-coastal and underserved communities and locations.
4. Action: OER will increase the number of student development opportunities by maximizing the use of internships, fellowship, and other student engagement programs.