

Performance Audit of Mid-Scale Research Infrastructure Incurred Costs – Smithsonian Astrophysical Observatory

REPORT PREPARED BY COTTON & COMPANY ASSURANCE AND ADVISORY, LLC

NATIONAL SCIENCE FOUNDATION
OFFICE OF INSPECTOR GENERAL

July 18, 2023
OIG 23-1-008





AT A GLANCE

Performance Audit of Mid-Scale Research Infrastructure Incurred Costs –
Report No. OIG 23-1-008
July 18, 2023

AUDIT OBJECTIVE

The National Science Foundation Office of Inspector General engaged Cotton & Company Assurance and Advisory, LLC (C&C) to conduct a performance audit of Smithsonian Astrophysical Observatory's (SAO) Mid-scale Research Infrastructure award. The auditors tested more than \$735,000 of the approximately \$6.1 million of costs claimed to NSF. The audit objective was to evaluate SAO's award management and oversight capabilities as they relate to the Mid-scale program requirements on NSF Award No. [REDACTED]. A full description of the audit's objectives, scope, and methodology is attached to the report as Appendix B.

AUDIT RESULTS

SAO generally complied with federal and NSF regulations, NSF program and award terms and conditions, and SAO policies while administering its Mid-scale award. However, the report identified three findings and one area for improvement related to SAO's compliance with award requirements. The auditors questioned \$2,496 of unallowable expenses and identified two compliance-related findings for which no costs were questioned: non-compliance with subaward policies and non-compliance with NSF's Mid-scale reporting policy. In addition to the findings, the report also includes one area for improvement related to NSF's Project Execution Plan development. C&C is responsible for the attached report and the conclusions expressed in it. NSF OIG does not express any opinion on the conclusions presented in C&C's audit report.

RECOMMENDATIONS

The auditors included three findings and one area for improvement in the report with associated recommendations for NSF to resolve the questioned costs and to ensure SAO strengthens administrative and management controls.

AUDITEE RESPONSE

SAO disagreed with the majority of the findings in the report and with the recommended area for improvement. SAO's response is attached in its entirety as Appendix A.

FOR FURTHER INFORMATION, CONTACT US AT OIGPUBLICAFFAIRS@NSF.GOV.



National Science Foundation • Office of Inspector General
2415 Eisenhower Avenue, Alexandria, Virginia 22314

MEMORANDUM

DATE: July 18, 2023

TO: Quadira Dantro
Director
Division of Institution and Award Support

Jamie French
Director
Division of Grants and Agreements

Matthew Hawkins
Office Head
Research Infrastructure Office

FROM: Daniel J. Buchtel [REDACTED]
Deputy Assistant Inspector General
Office of Audits

SUBJECT: Audit Report No. 23-1-008, Smithsonian Astrophysical Observatory

This memorandum transmits the Cotton & Company Assurance and Advisory, LLC (C&C) report for the audit of Smithsonian Astrophysical Observatory's (SAO) Mid-scale Research Infrastructure award. The audit encompassed more than \$735,000 of the approximately \$6.1 million of costs claimed to NSF during the period. The audit objective was to evaluate OSU's award management and oversight capabilities as they relate to the Mid-scale program requirements on NSF Award No. [REDACTED]. A full description of the audit's objectives, scope, and methodology is attached to the report as Appendix B.

Please coordinate with our office during the 6-month resolution period, as specified by OMB Circular A-50, to develop a mutually agreeable resolution of the audit findings. The findings should not be closed until NSF determines that all recommendations have been adequately addressed and the proposed corrective actions have been satisfactorily implemented.

OIG Oversight of the Audit

C&C is responsible for the attached auditors' report and the conclusions expressed in this report. We do not express any opinion on the conclusions presented in C&C's audit report. To fulfill our responsibilities, we:

- reviewed C&C's approach and planning of the audit;
- evaluated the qualifications and independence of the auditors;
- monitored the progress of the audit at key points;
- coordinated periodic meetings with C&C, as necessary, to discuss audit progress, findings, and recommendations;
- reviewed the audit report prepared by C&C; and
- coordinated issuance of the audit report.

We thank your staff for the assistance that was extended to the auditors during this audit. If you have any questions regarding this report, please contact Billy McCain at 703.292.7100 or OIGpublicaffairs@nsf.gov.

Attachment

cc: Stephen Willard, Dan Reed, Victor McCrary, John Veysey, Ann Bushmiller, Karen Marrongelle, Teresa Grancorvitz, Christina Sarris, Janis Coughlin-Piester, Linnea Avallone, Alex Wynnyk, Rochelle Ray, Charlotte Grant-Cobb, Allison Lerner, Lisa Vonder Haar, Ken Chason, Jennifer Kendrick, Ken Lish, Billy McCain, Sarah Adams, Louise Nelson, Karen Scott

EXECUTIVE SUMMARY

The Cotton & Company Assurance and Advisory, LLC, audit team determined that the Smithsonian Astrophysical Observatory (SAO) has generally complied with federal and NSF regulations, NSF program and award terms and conditions, and SAO policies while administering its Mid-scale Research Infrastructure 1 (Mid-scale RI-1) award. However, the audit team identified three findings and one area for improvement related to SAO's compliance with Mid-scale RI-1 award requirements.

AUDIT OBJECTIVES

The National Science Foundation Office of Inspector General engaged Cotton & Company Assurance and Advisory, LLC (herein referred to as "we"), to conduct a performance audit of costs SAO incurred on NSF Award No. [REDACTED] from the award's inception date through September 30, 2022. The audit objectives included evaluating SAO's award management and oversight capabilities as they relate to the Mid-scale RI-1 award and general grant management requirements. The audit scope also included performing testing to determine if costs claimed on the NSF award were allowable, allocable, reasonable, and in compliance with relevant federal and NSF regulations. We have attached a full description of the audit's objectives, scope, and methodology as [Appendix B](#).

AUDIT CRITERIA

The audit team assessed SAO's compliance with relevant federal regulations (i.e., 2 Code of Federal Regulations [CFR] 200); NSF Proposal and Award Policies and Procedures Guides (PAPPGs) 19-1 and 20-1; NSF's Mid-scale RI-1 Program Solicitation (NSF 19-537); NSF's *Major Facilities Guide* (MFG) (NSF 19-68); NSF's *Research Infrastructure Guide* (RIG) (NSF 21-107); and SAO policies and procedures. The audit team included references to relevant criteria within each finding and defined key terms within the Glossary located in [Appendix E](#).

We conducted this performance audit in accordance with *Generally Accepted Government Auditing Standards* (GAGAS) issued by the Comptroller General of the United States.

AUDIT FINDINGS

As summarized in [Appendix C](#), the auditors identified and questioned \$2,496 in direct costs SAO inappropriately claimed during the audit period, including:

- \$2,496 in unallowable software expenses

The audit report also includes two compliance-related findings for which the auditors did not question any costs:

- Non-compliance with subaward policies
- Non-compliance with Mid-scale reporting policy

In addition to the three findings, the audit report includes one area for improvement for SAO to consider related to:

- Project Execution Plan (PEP) development

RECOMMENDATIONS

The audit report includes four recommendations for NSF's Director of the Division of Institution and Award Support and one consideration for NSF's Office Head of the Research Infrastructure Office related to resolving the \$2,496 in questioned costs and ensuring SAO strengthens its award management environment, as summarized in [Appendix D](#).

AUDITEE RESPONSE

SAO disagreed with most of the findings in the report and with the recommended area for improvement. SAO's response to the audit report is attached, in its entirety, as [Appendix A](#).

Table of Contents

Background	1
Audit Scope.....	2
Audit Results	4
Finding 1: Unallowable Software Expenses.....	4
Finding 2: Non-Compliance with Subaward Policies	6
Finding 3: Non-Compliance with Mid-scale Reporting Policy	7
Area for Improvement 1: PEP Compliance	8
Appendix A: SAO’s Response	13
Appendix B: Objectives, Scope, and Methodology.....	18
Appendix C: Summary of Questioned Costs.....	22
Appendix D: Recommendations and Considerations.....	26
Appendix E: Glossary.....	28

Abbreviations

ACM\$	Award Cash Management \$ervice
CFR	Code of Federal Regulations
EHT	Event Horizon Telescope
FY	Fiscal Year
GAGAS	Generally Accepted Government Auditing Standards
GAO	Government Accountability Office
MFG	Major Facilities Guide
NSF	National Science Foundation
OIG	Office of Inspector General
PAPPG	Proposal and Award Policies and Procedures Guide
PEP	Project Execution Plan
PI	Principal Investigator
POP	Period of Performance
R&D	Research and Development
RI	Research Infrastructure
RIG	Research Infrastructure Guide
SAO	Smithsonian Astrophysical Observatory
SI	Smithsonian Institution

BACKGROUND

The National Science Foundation is an independent federal agency created “to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes” (Pub. L. No. 81-507). NSF funds research and education in science and engineering by awarding grants and contracts to educational and research institutions throughout the United States.

In 2019, NSF began awarding grants under its new Mid-scale **Research Infrastructure (RI)** Program, which was designed to provide NSF with an agile process for funding experimental research capabilities in the Mid-scale range.¹ The Mid-scale RI Program provides award funding through two tracks: Mid-scale Research Infrastructure 1 (**Mid-scale RI-1**) and Mid-scale Research Infrastructure 2 (**Mid-scale RI-2**). Specifically, Mid-scale RI-1 awards support the implementation or design stage of an RI project, while Mid-scale RI-2 awards support the implementation stage of an RI project.²

Most federal agencies have an Office of Inspector General that provides independent oversight of the agency’s programs and operations. Part of NSF OIG’s mission is to conduct audits and investigations to prevent and detect fraud, waste, and abuse. In support of this mission, NSF OIG may conduct independent and objective audits, investigations, and other reviews to promote the economy, efficiency, and effectiveness of NSF programs and operations, as well as to safeguard their integrity. NSF OIG may also hire a contractor to provide these audit services.

NSF OIG engaged Cotton & Company Assurance and Advisory, LLC (herein referred to as “we”), to conduct a performance audit of costs the Smithsonian Astrophysical Observatory (SAO) incurred on a single Mid-scale RI-1 award: NSF Award No. [REDACTED] NSF awarded this \$14.6 million award, titled “[REDACTED],” to SAO in September 2019 to enable SAO to plan a greatly enhanced EHT (EHT-II), with seven to eight additional telescopes placed around the world in locations designed to maximize imaging speed, dynamic range, and fidelity.

SAO is a research unit of the Smithsonian Institution (SI) in Cambridge, Massachusetts that concentrates on studies of solar radiance. In fiscal year (FY) 2021, SI reported approximately \$110.7 million in total federal expenditures within its **Research and Development (R&D) Cluster**, with approximately \$10.5 million in expenditures on NSF awards, as illustrated in Figure 1.

¹ Per NSF’s *Major Facilities Guide* (MFG) (NSF 19-68) and *Research Infrastructure Guide* (RIG) (21-107), a Mid-scale project includes research instrumentation, equipment, and upgrades to major research facilities or other research infrastructure investments that exceed the maximum amount funded by the Major Research Instrumentation Program but are below the minimum for a major multi-user research facility project.

² Per NSF Program Solicitations NSF (RI-1) 19-537 and NSF 19-542 (RI-2), the implementation track (RI-1) is intended to facilitate acquisition or construction for a Mid-scale-range implementation project, while the design track is intended to facilitate progress toward readiness.

Figure 1: SI's FY 2021 R&D Cluster Federal Expenditures



Source: The chart data is available on the Oversight.gov website (<https://www.oversight.gov/sites/default/files/oig-reports/SI/OIG-22-04.pdf>). The photo is publicly available on SAO's website (<https://www.cfa.harvard.edu/facilities-technology/cfa-facilities/headquarters-cambridge-ma>).

AUDIT SCOPE

This performance audit—conducted under Order No. 140D0422F0869—was designed to meet the objectives identified in the Objectives, Scope, and Methodology section of this report (**Appendix B**) and was conducted in accordance with *Generally Accepted Government Auditing Standards* (GAGAS) issued by the Comptroller General of the United States.

The objectives of this performance audit included evaluating SAO's award management and oversight capabilities as they relate to the Mid-scale RI-1 award and determining whether SAO complied with relevant NSF RI-1 award requirements, such as developing a Project Execution Plan (PEP). This audit also involved determining if costs that SAO claimed through NSF's Award Cash Management Service (ACM\$) from the award's inception date through September 30, 2022, were **allocable, allowable, reasonable**, and in compliance with NSF award terms and conditions and applicable federal financial assistance requirements. **Appendix B** provides detailed information regarding the audit objectives, scope, and methodology used for this engagement.

As illustrated in Figure 2, SAO provided general ledger data to support the \$6.1 million in expenses it claimed on one NSF award from the award's inception date through September 30, 2022.

Figure 2: Costs SAO Claimed on NSF Award No. [REDACTED]



Source: Auditor analysis of accounting data SAO provided, illustrating the total costs (\$6,103,460) by expense type, using financial information to support costs incurred on NSF Award No. [REDACTED] during the audit period. Please note that the “Other Direct Costs” in this table includes equipment, computer services, travel, publication, and other direct costs.

We judgmentally selected 50 transactions totaling \$735,112³ (see Table 1) and evaluated supporting documentation to determine whether the costs claimed on NSF Award No. [REDACTED] were allocable, allowable, and reasonable, and whether they were in conformity with NSF award terms and conditions, organizational policies, and applicable federal financial assistance requirements.

Table 1: Summary of Selected Transactions

Budget Category	Transaction Count	Expense Amount ⁴
Subaward	8	\$453,419
Salary	12	145,065
Indirect Costs	6	55,986
Other	12	37,457
Equipment	4	26,976
Materials and Supplies	2	6,708
Travel	3	5,404
Publication	2	2,935
Fringe	1	1,162
Total	<u>50</u>	<u>\$735,112</u>

Source: Auditor summary of selected transactions.

We also performed non-transaction-based testing to determine whether the Mid-scale RI-1 PEP that SAO submitted for this award covered all required components and whether SAO

³ The \$735,112 represents the total value of the 50 transactions selected for transaction-based testing. It does not represent the dollar base of the total costs reviewed during the audit.

⁴ The expense amounts reported represent the total dollar value of the transactions selected for our sample; they do not include the total **fringe benefits** or **indirect costs** applied to the sampled transactions. However, we tested the fringe benefits and indirect costs for **allowability**.

appropriately estimated the full lifecycle cost for the project in a manner consistent with relevant NSF program guidance.

AUDIT RESULTS

We identified and questioned \$2,496 in costs that SAO charged to NSF Award No. [REDACTED]. We also identified exceptions that did not result in **questioned costs**, but did result in non-compliance with federal, NSF, or SAO-specific policies and procedures. See Table 2 for a summary of questioned costs by finding area, **Appendix C** for a summary of questioned costs by NSF award, and **Appendix D** for a summary of all recommendations.

Table 2: Summary of Questioned Costs by Finding Area

Finding Description	Questioned Costs
Unallowable Software Expenses	\$2,496
Non-Compliance with Subaward Policies	-
Non-Compliance with Mid-scale Reporting Policy	-
Total	<u>\$2,496</u>

Source: Auditor summary of findings identified.

We made four recommendations for NSF’s Director of the Division of Institution and Award Support related to resolving the \$2,496 in questioned costs and ensuring SAO strengthens its administrative and management policies and procedures for monitoring federal funds and administering its Mid-scale RI-1 award.

We also identified two areas where SAO could consider improving its controls to ensure future compliance with RI-1 Program requirements and made one suggestion related to an **area for improvement** included for SAO’s consideration.

We communicated the results of our audit and the related findings, area for improvement, recommendations, and consideration to SAO and NSF OIG. We included SAO’s response to this report, in its entirety, in **Appendix A**.

FINDING 1: UNALLOWABLE SOFTWARE EXPENSES

SAO charged NSF Award No. [REDACTED] for \$2,496 in software expenses that did not appear to be reasonable or to have been consistently treated, as required for the costs to be allowable per federal regulations⁵ and NSF **Proposal and Award Policies and Procedures Guide (PAPPG)**.⁶

⁵ According to 2 Code of Federal Regulations (CFR) 200 Revised, Section §200.403(a), *Factors affecting allowability of costs*, except where otherwise authorized by statute, costs must meet the following general criteria in order to be allowable under federal awards: be necessary and reasonable for the performance of the federal award, be allocable thereto under these principles, and be accorded consistent treatment. A cost may not be assigned to a federal award as a direct cost if any other cost incurred for the same purpose in like circumstances has been allocated to the federal award as an indirect cost.

⁶ NSF PAPPG 20-1, Part II, Chapter X, Section A, *Basic Considerations*, states that expenditures under NSF cost-reimbursement grants are governed by the federal cost principles and must conform to NSF policies where articulated in the applicable grant general terms and conditions, grant special provisions, and grantee internal policies.

Specifically, in April 2021, SAO charged NSF Award No. [REDACTED] for \$2,496 associated with the purchase of 15 video conferencing service licenses effective for the period from February 1, 2021, to January 31, 2022. SAO noted that it used these video conferencing licenses to assist in achieving award objectives; however, because all SI/SAO employees already had access to licenses from the same video conferencing service during that period, it does not appear reasonable for SAO to have charged these costs to the NSF award. Further, SAO’s direct charging of these video conferencing costs does not appear consistent with its treatment of other costs it incurred for the same services.

Conclusion

SAO did not appropriately consider the availability of video conferencing services for all SI/SAO employees prior to renewing the licenses it had purchased before the services became globally available to all SI/SAO employees in April 2020.

As the video conferencing licenses do not appear to be allowable as direct expenses on the NSF award, we are questioning \$2,496 in unallowable expenses charged to the NSF award, as illustrated in Table 3.

Table 3: Finding 1 Summary: Unallowable Software Expenses

NSF Award No.	Description	Fiscal Year(s)	Questioned Costs			SAO Agreed to Reimburse
			Direct	Indirect	Total	
[REDACTED]	Unallowable Video Conferencing Licenses	2021	\$2,250	\$246	\$2,496	\$0
Total			<u>\$2,250</u>	<u>\$246</u>	<u>\$2,496</u>	<u>\$0</u>

Source: Auditor summary of identified exception.

Recommendations

We recommend that NSF’s Director of the Division of Institution and Award Support:

- 1.1. Resolve the \$2,496 in questioned software costs and direct SAO to repay or otherwise remove the sustained questioned costs from its NSF award.
- 1.2. Direct SAO to implement additional screening processes that require procurement or other relevant personnel to verify software licenses are not otherwise available to employees prior to purchasing or renewing software licenses.

Smithsonian Astrophysical Observatory Response: SAO disagreed with this finding, noting that it believes the costs are reasonable and allowable. Specifically, SAO noted that [REDACTED] determined it was necessary to renew the licenses despite the software being otherwise available because the team had trouble transitioning to the new SI software. SAO noted that it renewed the licenses to ensure the ongoing success of

the RI-1 effort during a time when video conferencing was central to team and collaborative activities.

Auditors' Additional Comments: Our position regarding this finding has not changed. Although SAO's formal response noted that SAO renewed the licenses because █████ concluded that transitioning to the SI platform presented too much risk, because SAO did not provide documentation to support that it assessed the availability of the SI licenses before renewal, and because this software was available to SAO at the time it renewed the licenses, our position regarding this finding has not changed.

FINDING 2: NON-COMPLIANCE WITH SUBAWARD POLICIES

SAO did not use the Subawardee Commitment Forms⁷ when issuing, or use the Subaward Monitoring Checklist █████⁸ when monitoring, three **subawards** issued under NSF Award No. █████ as required per SI's *Sponsored Projects Handbook*.⁹ Specifically, █████ did not complete Subawardee Commitment Forms or Subaward Monitoring Checklists when issuing and monitoring subawards to the █████, the █████, or the █████.

Conclusion

SAO noted that because SI's *Sponsored Projects Handbook* was not originally intended for SAO, it has not utilized the Subawardee Commitment Forms or Subaward Monitoring Checklists. SAO noted that it is working with SI to update the *Sponsored Projects Handbook*; however, its current procedures are not consistent with the procedures outlined in the handbook.

Because these instances of non-compliance did not directly result in SAO charging unallowable costs to the NSF award, we are not questioning any costs related to these exceptions. However, we are noting a compliance finding because SAO did not follow the procedures outlined in SI's *Sponsored Projects Handbook*, as illustrated in Table 4.

⁷ According to SI's *Sponsored Projects Handbook*, *Required Documentation* section, when a non-standard office of sponsored programs subcontract or consulting contract is necessary, █████ should have their subcontractor(s) complete the Subawardee Commitment Form.

⁸ Per the *Monitoring of Subcontractor or Consultant Performance* section of SI's *Sponsored Projects Handbook*, █████ monitoring responsibilities are found in the Subaward Monitoring Checklist █████. According to SI's Subaward Monitoring Checklist █████, because SI is required to monitor the activities of all subawardees on government grants, █████ are responsible for completing this Checklist to ensure subawardees conduct their portions of projects in compliance with laws, regulations, and the provisions of awards, and that project costs are reasonable and allowable.

⁹ SAO provided SI's *Sponsored Projects Handbook* as one of the policies applicable to SAO for administrative and financial management of federal grant funds.

Table 4: Finding 2 Summary: Non-Compliance with SAO Policies

NSF Award No.	Compliance Exception Identified	Fiscal Year(s)
[REDACTED]	Subaward	2020, 2021, and 2022
[REDACTED]	Subaward	2020, 2021, and 2022
[REDACTED]	Subaward	2020, 2021, and 2022

Source: Auditor summary of identified exceptions.

Recommendations

We recommend that NSF’s Director of the Division of Institution and Award Support:

- 2.1. Direct SAO to implement a new policy that outlines its current procedures for issuing and monitoring subawards. Updated procedures should reflect SAO’s current process for issuing and monitoring subawards or should ensure subawards are issued and monitored in a manner consistent with SI’s *Sponsored Project Handbook*.

Smithsonian Astrophysical Observatory Response: SAO disagreed with this finding, noting that the content and forms in the SI’s *Sponsored Project Handbook* are not policy documents. Specifically, SAO noted that the handbook represents procedures that central SI units should follow to meet federal standards; however, because SAO has delegated authority for financial and grant management, it uses its own internal controls to ensure it complies with federal standards.

Auditors’ Additional Comments: Our position regarding this finding has not changed. Although SAO did provide documentation to support its compliance with the subaward requirements outlined in 2 CFR 200, because SAO did not monitor its subawards as outlined in the policy document it provided to support how it monitors subawards, our position regarding this finding has not changed.

FINDING 3: NON-COMPLIANCE WITH MID-SCALE REPORTING POLICY

SAO did not submit its annual project reports for NSF Award No. [REDACTED] at least 90 days prior to the end of the budget period, as required per the NSF RI-1 Program Solicitation.¹⁰ Specifically, SAO did not submit any of the three annual reports due within our audit **period of performance** (POP) by the report due dates, as illustrated in Table 5.

Table 5: Annual Mid-scale RI-1 Reports Not Submitted Timely

Reporting Period	Report Due Date	Report Submission Date	Days Late
October 1, 2019 – September 30, 2020	July 2, 2020	August 14, 2020	43
October 1, 2020 – September 30, 2021	July 2, 2021	November 11, 2021	132
October 1, 2021 – September 30, 2022	July 2, 2022	September 30, 2022	90

Source: Auditor summary of identified exceptions.

¹⁰ Per the Mid-scale RI-1 Program Solicitation (NSF 19-537), Section VII.C., *Reporting Requirements*, [REDACTED] must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period.

Conclusion

SAO did not have adequate oversight or proper monitoring controls in place to verify that it submits RI-1 programmatic reports in a manner consistent with the NSF Program Solicitation. Rather, it relies on [REDACTED] submit annual reports by the due dates.

Because these instances of non-compliance did not directly result in SAO charging unallowable costs to the NSF award, we are not questioning any costs related to these exceptions. However, we are noting compliance exceptions for the three instances in which SAO did not submit the annual reports by the due dates required per the NSF Program Solicitation, as illustrated in Table 6.

Table 6: Finding 3 Summary: Annual Mid-scale RI-1 Reports Not Submitted Timely

NSF Award No.	Compliance Exception Identified	Fiscal Year(s)
[REDACTED]	2019-2020 RI-1 Annual Report Not Submitted Timely	2020
[REDACTED]	2020-2021 RI-1 Annual Report Not Submitted Timely	2021
[REDACTED]	2021-2022 RI-1 Annual Report Not Submitted Timely	2022

Source: Auditor summary of identified exceptions.

Recommendations

We recommend that NSF's Director of the Division of Institution and Award Support:

- 3.1. Direct SAO to implement controls that ensure Mid-scale Program annual reports are submitted on a timely basis, as required per the Research Infrastructure 1 Program Solicitation.

Smithsonian Astrophysical Observatory Response: SAO agreed with this finding and noted that it intends to strengthen its controls on reporting compliance by introducing: (1) an awards management office with report oversight; (2) a ticketing and escalation system to track the award reporting workflow and escalate any delays; and (3) monitoring of personnel performance within the reporting workflow. However, SAO did note that it believed the due dates listed in the report were incorrect.

Auditors' Additional Comments: Our position regarding this finding has not changed. With respect to SAO's comment that the due dates were incorrect, because the dates identified are 90 days before the end of the October 1 to September 30 reporting period and because the dates identified are consistent with the due dates on NSF's Research.gov website, we have not made any updates to the due dates reported.

AREA FOR IMPROVEMENT 1: PEP COMPLIANCE

The PEPs that SAO has submitted for NSF Award No. [REDACTED] do not contain all of the information recommended per NSF's *Major Facilities Guide* (MFG) or its *Research*

Infrastructure Guide (RIG),¹¹ which replaced the MFG in December 2021. Specifically, although both guides state that the 38 subtopics identified in Table 3.4.1, which represent the minimum PEP components required for Mid-scale RI-1 projects,¹² SAO's PEPs did not include all of these elements nor did SAO provide justifications within its PEPs as to why the elements were not applicable or included.

SAO's PEP Did Not Include All Recommended Elements

The most recent SAO PEP provided during the audit period did not include 2 of the 38 recommended subtopics, including:

- **Cost Book, Cost Model Data Set, and Basis of Estimate [4.7]**¹³
- **Code Development Plan [12.2]**¹⁴

Further, although SAO has updated its most recent PEP to include these sections, the original version SAO submitted did not include 6 of the 38 recommended subtopics, including:

- **Partnerships [2.3]**¹⁵
- **Summary of Total Project Definition [4.1]**¹⁶
- **Scope Management Plan and Scope Contingency [4.4]**¹⁷
- **Budget Contingency [4.6]**¹⁸
- **Cost Book, Cost Model Data Set, and Basis of Estimate [4.7]**¹⁹

¹¹ NSF's MFG and RIG contain NSF policy on the planning and management of major facilities and Mid-scale projects through their full lifecycle.

¹² Per the *Guidance for Mid-Scale Research Infrastructure Projects* section of the MFG and RIG, *Programmatic Deliverables*, the following list provides the minimum required components of the PEP for a Mid-scale project: 1. Introduction; 2. Organization; 4. Construction Project Definition; 6. Risk and Opportunity Management; 8. Configuration Control; 9. Acquisitions; 10. Project Management Controls; 12. Cyber-Infrastructure; and 13. Commissioning, including Concept of Operations.

¹³ Per Table 3.4.1 in the MFG and RIG, subtopic 4.7, *Cost Book, Cost Model Data Set, and Basis of Estimate*, the PEP should include a cost book to support the total project cost, a cost model data set to be used as an input to software tools, and a basis of estimate outlining the details used in establishing project estimates.

¹⁴ Per Table 3.4.1 in the MFG and RIG, subtopic 12.2, *Code Development Plan*, the PEP should include a plan to enable critical scientific/engineering capabilities and data flows within the facility as well as interoperability with key external collaborators or stakeholders.

¹⁵ Per Table 3.4.1 in the MFG and RIG, subtopic 2.3, *Partnerships*, the PEP should include the role of interagency or international partners in future planning and development and/or construction.

¹⁶ Per Table 3.4.1 in the MFG and RIG, subtopic 4.1, *Summary of Total Project Definition*, the PEP should include a summary at work breakdown structure level II of total construction project scope, cost, and schedule required to complete the construction or implementation of the project.

¹⁷ Per Table 3.4.1 in the MFG and RIG, subtopic 4.4, *Scope Management Plan and Scope Contingency*, the PEP should describe how the scope will be defined, developed, monitored, controlled, and validated, and how scoping opportunities and descoping options will be realized.

¹⁸ Per Table 3.4.1 in the MFG and RIG, subtopic 4.6, *Budget Contingency*, the PEP should include a contingency budget and description of the method for calculating the contingency, including the confidence level for completing the project within budget.

¹⁹ Per Table 3.4.1 in the MFG and RIG, sub-topic 4.7, *Cost Book, Cost Model Data Set, and Basis of Estimate*, the PEP should include a cost book to support the total project cost, a cost model data set to be used as an input to software tools, and a basis of estimate outlining the details used in establishing project estimates.

- **Schedule Contingency [4.10]**²⁰

SAO's PEP Was Not Sufficiently Detailed

The information included within SAO's PEP for 5 of the 38 recommended subtopics did not include narratives that were consistent with the requirements outlined in the MFG or RIG, as follows:

- **Cost Estimating Plan, Executive Summary, and Baseline Budget [4.5].**²¹ This section did not include the plan to establish and communicate how the preparation, development, review, and approval of how the estimate would be completed or the overall basis of estimate described in this subsection's requirements.²² Further, based on the cost estimate data provided, it does not appear that SAO's cost estimate was developed in accordance with the best practices outlined in the Government Accountability Office (GAO) *Cost Estimating and Assessment Guide*, as recommended.
- **Schedule Contingency [4.10].**²³ This section neither included the method of calculating contingency nor the confidence level for meeting the project end date described in this subsection's requirements.
- **Contingency Management Plan [6.3].**²⁴ This section neither included the contingency management plans and approval processes using change control nor did it include NSF's approval requirements per the cooperative agreements described in this subsection's requirements.
- **Acquisition Plans [9.1].**²⁵ This section did not include the time-based list of acquisitions and procurement actions described in this subsection's requirements.

²⁰ Per Table 3.4.1 in the MFG and RIG, subtopic 4.10, *Schedule Contingency*, the PEP should include schedule contingency amounts and project end date with contingency, and should state the method for calculating contingency, including the confidence level for meeting the project end date.

²¹ Per the *Guidance for Mid-Scale Research Infrastructure Projects* section of the MFG and RIG, budgets should be supported by well-documented basis of estimates developed in accordance with the best practices and 12 steps outlined in the GAO *Cost Estimating and Assessment Guide* to meet the four characteristics of a high-quality estimate: well-documented, comprehensive, accurate, and credible.

²² Per Table 3.4.1 in the MFG and RIG, subtopic 4.5, *Cost Estimating Plan, Executive Summary, and Baseline Budget*, this section of the PEP should include a plan to establish and communicate how the preparation, development, and approval of the estimate will be completed; an executive summary that identifies costs at a high level; and an overall basis of estimate.

²³ Per Table 3.4.1 in the MFG and RIG, subtopic 4.10, *Schedule Contingency*, the PEP should include schedule contingency amounts and a project end date with contingency and should state the method for calculating contingency, including the confidence level for meeting the project end date.

²⁴ Per Table 3.4.1 in the MFG and RIG, subtopic 6.3, *Contingency Management Plan*, the PEP should include contingency management plans and approval processes using change control and should describe NSF's approval requirements per cooperative agreements.

²⁵ Per Table 3.4.1 in the MFG and RIG, subtopic 9.1, *Acquisition Plans*, the PEP should describe acquisition plans, processes, subawards, and contracting strategy, and should include a time-based list of acquisitions and procurement actions.

- **Financial and Business Controls [10.3].**²⁶ This section did not include the description of financial and business processes and controls described in this subsection's requirements but rather only noted the individual responsible for oversight.

Further, although SAO's most recent PEP did include the subsection requirement descriptions recommended, it did not include subtopic headings to allow readers to easily identify this information for the following 7 of the 38 subtopics NSF notes should be included in its PEP.

- **Facility/Infrastructure [1.3]**²⁷
- **Scientific & Broader Societal Impacts [1.4]**²⁸
- **Partnerships [2.3]**²⁹
- **Community Relations and Outreach [2.5]**³⁰
- **Change Control Plan [8.2]**³¹
- **Document Control Plan [8.3]**³²
- **Acquisition Approval Process [9.2]**³³

Conclusion

Because the MFG and RIG note only that these items should be included, and because NSF approved SAO's PEP, we did not note any findings related to the missing PEP elements. However, because these guides state that PEPs should ideally either contain or reference all

²⁶ Per Table 3.4.1 in the MFG and RIG, subtopic 10.3, *Financial and Business Controls*, the PEP should describe financial business processes and controls.

²⁷ Per Table 3.4.1 in the MFG and RIG, subtopic 1.3, *Facility/Infrastructure*, the PEP should describe the infrastructure necessary to obtain the research and education objectives.

²⁸ Per Table 3.4.1 in the MFG and RIG, subtopic 1.4, *Scientific & Broader Societal Impacts*, the PEP should describe the broader societal impacts associated with the purpose of the facility, including the scope of work, budget, and schedule related to science community- or society-related actions or interactions. We noted that SAO did note that this section was not applicable; however, this information is included within its award proposal.

²⁹ Per Table 3.4.1 in the MFG and RIG, subtopic 2.3, *Partnerships*, the PEP should include the role of interagency or international partners in future planning and development and/or construction, plans, agreements, and commitments for interagency and international partnerships, and a description of the project's stakeholders and their roles, responsibilities, and meeting schedules.

³⁰ Per Table 3.4.1 in the MFG and RIG, subtopic 2.5, *Community Relations and Outreach*, the PEP should include the plans for building and maintaining effective relationships with the broader research community that will eventually utilize the facility to conduct research and with the public, and include a description of scientific and educational outreach programs.

³¹ Per Table 3.4.1 in the MFG and RIG, subtopic 8.2, *Change Control Plan*, the PEP should include a plan to manage accounting changes and changes in the baseline or performance measurement baseline plan; changes in scope, modifications to budget or schedule, and movement of contingencies into or out of the performance measurement baseline; and include approval and documentation processes plus roles and responsibilities.

³² Per Table 3.4.1 in the MFG and RIG, subtopic 8.3, *Document Control Plan*, the PEP should include a plan for managing version control, access, and archiving of project-related documentation.

³³ Per Table 3.4.1 in the MFG and RIG, subtopic 9.2, *Acquisition Approval Process*, the PEP should describe the approval process for acquisition (NSF and internal) and create a year-by-year acquisition plan of actions that are estimated to require NSF approval.

project-related documents and be the standalone source explaining how and why the project meets all requirements, we believe SAO could improve its PEP by including and labeling all information recommended per the MFG and RIG.

Consideration

We suggest that NSF's Office Head of the Research Infrastructure Office consider:

- Directing SAO to update its Project Execution Plan to include all recommended elements and/or justifications regarding why those elements are not applicable.

Smithsonian Astrophysical Observatory Response: SAO disagreed with the recommended area for improvement, noting that because its PEP follows the format dictated by the solicitation and is a living document that is revised as part of the award process and updated as NSF requests clarifications, it does not agree with the recommendation provided.

Auditors' Additional Comments: Our position regarding this recommended area for improvement has not changed.

COTTON & COMPANY ASSURANCE AND ADVISORY, LLC



Megan Mesko, CPA, CFE
Partner
July 7, 2023

APPENDIX A: SAO'S RESPONSE



Smithsonian Astrophysical Observatory

June 6, 2022

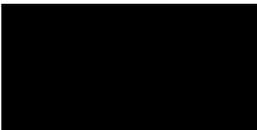
Cotton & Company
333 John Carlyle Street, Suite 500
Alexandria, Virginia 22314

Attention: Megan Mesko, CPA, CFE

Dear Ms. Mesko,

The Smithsonian Astrophysical Observatory (SAO) appreciates the opportunity to work with the National Science Foundation Office of Inspector General and Cotton & Company to examine our research accounting practices related to NSF Award No. [REDACTED]. SAO takes seriously our obligation to administer all sponsored awards in compliance with all applicable laws, policies, and requirements. SAO believes that one of the positive outcomes of an audit is the opportunity to improve and enhance our practices, policies, and procedures. We will work with NSF during the resolution process to enhance our compliance environment. SAO does not agree with Finding 1: Unallowable Software Expense. SAO also does not agree with Finding 2: Non-Compliance with Subaward Policies. SAO does, however, agree with Finding 3: Non-compliance with Mid-Scale Reporting Policy. And lastly, SAO does not agree with Area for Improvement 1: PEP Compliance. The details regarding all the Findings and Area for Improvements are detailed in the Formal Draft Response memo.

Sincerely,



Professor Lisa Kewley, FAA, FNAS, FAAS
Director

SMITHSONIAN INSTITUTION
60 Garden Street
Cambridge, MA 02138-1516
Tel. 617.495.7000

Smithsonian Astrophysical Observatory (SAO) Audit Report Response

Finding 1: Unallowable Software Expenses

SAO disagrees with this finding. The cost is reasonable and allowable. Although SAO renewed ██████ licenses in the amount of \$2,496 for use by the MSRI-1 project after SI announced the availability of SI-wide ██████ licenses, there were legitimate operational and continuity reasons for this decision. During this period (circa 2021) SAO was fully remote due to the ongoing COVID emergency. When SI announced that the ██████ platform was available to all SI staff including SAO, the SAO Purchasing Officer contacted SAO administrators who had purchased individual ██████ licenses to notify them of this new opportunity. In response, ██████ made a good faith effort to transition to SI ██████ but encountered practical complications to implementation, as SI ██████ could only be accessed via the SI telework portal, which in turn required use of an @si.edu email address which most SAO staff did not possess at that time (SAO has its own IT systems, uses the Harvard network, and staff have @cfa.harvard.edu email addresses). As nearly all team activities and discussions were facilitated through ██████ at that time, ██████ concluded it was operationally too risky to transition to the SI ██████ platform until these access issues were properly addressed. This decision was not made lightly and was done to ensure the ongoing success of the MSRI-1 effort during a time when video conferencing was central to team and collaborative activities.

Finding 2: Non-Compliance with Subaward Policies

SAO disagrees with this finding. The content and forms in the SI OSP Handbook are not policy documents, as all Federal awards are ultimately governed by the Uniform Guidance regulations (2 CFR 200) and the terms and conditions from the Prime award document. In this context, the OSP Handbook represents procedures that Central SI Units should follow to meet these Federal standards. As SAO has delegated authority for financial management, research administration, and grant management, and is a recipient of numerous Federal awards, it has multiple internal controls in place regarding subaward monitoring to ensure compliance with the Uniform Guidance and the Prime award. Taken together, these controls satisfy the requirements as outlined in the SI Subaward Commitment Form and PI Annual Checklist.

Specifically, regarding pre-award documentation, SAO performs a risk assessment of all sub-awardees as required by the Uniform Guidance. The assessment includes Overall Organization Strength and Stability; Compliance Oversight for Federal Awards; Past Performance; and Role in Proposed Project. This information covers many of the items noted in the SI Subaward Commitment form. For completeness, we have attached supporting documentation for items #3 and #4 (research integrity and research conduct). Item #5 is not applicable to this NSF award. Items within the purview of Section B of this form were not required of these subrecipients.

Although SAO does not use the SI PI Annual Checklist, the same information is routinely collected, monitored, reviewed, and evaluated by multiple SAO staff members with different roles and

responsibilities across the organization. SAO PIs review items #1 and #2 with the subrecipients; items #3 and #4 are completed by the allocated SAO Contracting Officer in consultation with [REDACTED] and fund manager. Items #1-4 are reviewed on a monthly basis by SAO personnel. Item #5 is completed/performed by the SAO Contracting Officer and [REDACTED] and Item #6 is performed by the SAO Contracting Officer and Project Manager.

SAO has adopted extensive internal controls to meet the standards for Federal award management and oversight in accordance with the Uniform Guidance. Although our controls and procedures differ from those implemented by Central SI Units, they accomplish the same outcome and meet the standards set by Federal regulations.

Finding 3: Non-Compliance with Mid-Scale Reporting Policy

SAO concurs with this finding. SAO confirms the dates on which the reports were submitted are accurate as shown in the finding. SAO properly reported in the 2022 Annual Report under the “Personnel” reporting category that due to retirement, SAO transitioned to a new Project Manager. The new Project Manager is fully versed in the program reporting requirements, and we do not expect the noted finding to be an issue moving forward. We intend to strengthen our control on reporting compliance by introducing (1) an awards management office with oversight of reporting, (2) a ticketing and escalation system to track the award reporting workflow and escalate any delays, and (3) monitoring of personnel performance within the reporting workflow.

We note an apparent discrepancy in Finding 3 titled “Annual Mid-Scale RI-1 Reports Not Submitted Timely.” The finding lists the Annual Reports due date as July 2. We believe the due date should be listed as August 1 as the NSF AST-1935980 Mid-scale RI-1 Basic award notice (dated September 16, 2019) states:

“A Quarterly Project Report will be prepared and submitted to NSF, as an interim report in FastLane, within 30 days following the end of each three-month reporting period. The third report each year will be submitted as an Annual Report to Fastlane.”

Area for Improvement 1: PEP Compliance

SAO disagrees with this recommendation. The PEP is a universal form used for all NSF awards and as such it includes sections or items that are not applicable to the present award.

The auditors noted differences between the originally submitted PEP and the guidelines in the Major Facilities Guide (MFG), mostly regarding the lack of headings but also in the exclusions of certain sections. Specific points we would like to emphasize are:

1. **The “submitted” PEP follows the format dictated by the solicitation.** In the original MSRI-1 [solicitation](#) (circa 2019), NSF specifies a very specific format for the PEP which differs from that

specified in the MFG. The PEP submitted by SAO followed this required format and included all required content. In those instances where information was absent, our submission included an appendix listing those sections with an accompanying justification - mainly, that our MSRI-1 was a design program and therefore sections that relate to implementation and construction programs are not applicable. (For example, section 4 in the MFG outline is specific to construction projects.)

2. **The PEP is revised as part of the award process.** The original award notification (circa 2019) for the MSRI-1 program states: *Within 60 days of award, the awardee will submit an updated Project Execution Plan using an NSF-provided template.* The SAO program team worked with NSF program officers who supplied a template designed for use by mid-scale programs like ours. Revision 1 employed this supplied template. Revision 2 was the first version accepted by NSF. Note that the NSF supplied template does not follow the MFG outline exactly; our PEP satisfies the NSF supplied template.
3. **The PEP is a living document.** The PEP is expected to change over the course of the program as new information becomes available or NSF seeks clarification. We are currently at version 11 of the PEP; the most recent changes came at the request of the NSF to clarify sections that were previously viewed as adequate/acceptable.

Finally, the MFG outline provides an example of what is typical, and explicitly states *“Additions or alterations to the typical PEP components listed below are likely due to the unique nature of each specific project.”* In this context, the MFG outline serves as an example not a template, as evidenced from the fact that the original template provided by NSF does not follow headings specified in the MFG.

APPENDIX B: OBJECTIVES, SCOPE, AND METHODOLOGY

OBJECTIVES

The NSF OIG Office of Audits engaged Cotton & Company Assurance and Advisory, LLC (herein referred to as “we”), to conduct an audit of all the costs Smithsonian Astrophysical Observatory (SAO) claimed on NSF Award No. [REDACTED] as of September 30, 2022. The objectives of the audit included:

- Evaluating SAO’s award management environment for the capability to adhere to award-specific terms and conditions, as well as the requirements of the *Uniform Guidance* and general award terms and conditions.
- Determining if the costs claimed on the award were allocable, allowable, reasonable, and in conformance with NSF award terms and conditions and applicable federal financial assistance requirements.
- Determining whether SAO complied with NSF’s Research Infrastructure (RI)-1 Program Solicitation (19-537) and other Mid-scale program requirements within NSF’s *Major Facilities Guide* (MFG) (NSF 19-68) and *Research Infrastructure Guide* (RIG) (21-107), such as developing a Project Execution Plan (PEP).

SCOPE

The audit population included approximately \$6.1 million in expenses SAO claimed in Award Cash Management Service (ACM\$) on NSF Award No. [REDACTED] from the award’s inception date through September 30, 2022.

METHODOLOGY

After obtaining NSF OIG’s approval for our audit plan, we performed each of the approved audit steps. Generally, these steps included:

- Assessing the reliability of the general ledger data SAO provided by comparing the costs charged to NSF awards per SAO’s accounting records to the reported net expenditures reflected in the ACM\$ drawdown requests.
 - Our work required us to rely on computer-processed data obtained from SAO and NSF OIG. NSF OIG provided award data SAO reported through ACM\$ during our audit period.
 - We assessed the reliability of the general ledger data SAO provided by: (1) comparing the costs charged to NSF awards per SAO’s accounting records to the reported net expenditures reflected in the ACM\$ drawdown requests that SAO submitted to NSF during the audit’s period of performance (POP); and (2) reviewing the parameters SAO used to extract transaction data from its accounting system. As we did not identify any discrepancies in the data provided, we found SAO’s

computer-processed data to be sufficiently reliable for the purposes of the audit.

- We found NSF’s computer-processed data to be sufficiently reliable for the purposes of this audit. We did not review or test whether the data contained in NSF’s databases or the controls over NSF’s databases were accurate or reliable; however, the independent auditor’s report on NSF’s financial statements for fiscal year (FY) 2021 found no reportable instances in which NSF’s financial management systems did not substantially comply with applicable requirements.
- SAO provided detailed transaction-level data to support the \$6,103,460 in costs it claimed in ACM\$ during the audit period. This data resulted in a total audit universe of \$6,103,460 in expenses claimed on NSF Award No. [REDACTED]
- Obtaining and reviewing all available accounting and administrative policies and procedures, external audit reports, desk review reports, and other relevant information SAO and NSF OIG provided, as well as any other relevant information that was available online.
- Summarizing our understanding of federal, NSF, RI-1 award, and SAO-specific policies and procedures surrounding costs budgeted for or charged to NSF awards and identifying the controls in place to ensure that costs charged to the RI-1 award were reasonable, allocable, and allowable.
 - In planning and performing this audit, we considered SAO’s internal controls that were within the audit’s scope solely to understand the directives or policies and procedures SAO has in place to ensure that charges against NSF awards complied with relevant federal regulations, NSF award terms, RI Program requirements, and SAO policies.
- Designing and executing tests that allowed our team to determine whether the Mid-scale RI-1 PEP covered all required components and whether SAO appropriately estimated the full lifecycle cost for the project in a manner consistent with NSF’s MFG (NSF 19-68), RIG (21-107), and RI-1 Program Solicitation (19-537) applicable to the sampled NSF award.
- Providing SAO with a list of 50 transactions that we selected based on the results of our data analytics and requesting that SAO provide documentation to support each transaction.
- Reviewing the supporting documentation SAO provided and requesting additional documentation as necessary to ensure we obtained sufficient, appropriate evidence

to assess the allowability of each sampled transaction under relevant federal,³⁴ NSF,³⁵ and SAO policies.³⁶

- Holding virtual interviews and walkthroughs with SAO in December 2022 and January 2023 to discuss SAO's PEP, as well as controls SAO has in place around payroll (including effort reporting), fringe benefits, travel, participant support costs, procurement, equipment, other direct costs (e.g., patent, relocation, recruiting, interest, advertising/public relations, entertainment, fundraising, lobbying, selling/marketing, and training costs), grant close-out procedures, subawards, ACM\$ processing, indirect costs, and other general policies in place to ensure compliance with relevant NSF terms and conditions (e.g., programmatic reporting, supplemental funding requests, changes in scope, cost transfers, record retention, whistle-blower information, research misconduct, and conflict of interest policies).

At the conclusion of our fieldwork, we provided a summary of our results to NSF OIG personnel for review. We also provided the summary to SAO personnel to ensure that SAO was aware of each of our findings and that it did not have additional documentation to support the questioned costs.

We conducted this performance audit in accordance with *Generally Accepted Government Auditing Standards* (GAGAS) issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

³⁴ We assessed SAO's compliance with 2 Code of Federal Regulations (CFR) Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*, as appropriate.

³⁵ We assessed SAO's compliance with NSF Proposal and Award Policies and Procedures Guides (PAPPGs) 19-1, and 20-1 and with NSF award-specific terms and conditions, as appropriate.

³⁶ We assessed SAO's compliance with its internal policies and procedures surrounding costs budgeted for or charged to NSF awards.

APPENDIX C: SUMMARY OF QUESTIONED COSTS

Appendix C, Table 1: Schedule of Questioned Costs by Finding

Finding	Description	Questioned Costs		Total
		<i>Unsupported</i>	<i>Unallowable</i>	
1	Unallowable Software Expenses	\$0	\$2,496	\$2,496
2	Non-Compliance with Subaward Policies	-	-	-
3	Non-Compliance with Mid-scale Reporting Policy	-	-	-
Total		<u>\$0</u>	<u>\$2,496</u>	<u>\$2,496</u>

Source: Auditor summary of questioned costs by finding.

Appendix C, Table 2: Summary of Questioned Costs by NSF Award Number

NSF Award No.	No. of Transaction Exceptions	Questioned Direct Costs	Questioned Indirect Costs	Questioned Total	SAO Agreed to Reimburse
██████	4	\$2,250	\$246	\$2,496	\$0
Total	<u>4</u>	<u>\$2,250</u>	<u>\$246</u>	<u>\$2,496</u>	<u>\$0</u>

Source: Auditor summary of questioned costs by NSF award number.

Appendix C, Table 3: Summary of Questioned Costs by NSF Award Number and Expense Description

Finding No.	NSF Award No.	Expense Description	Questioned Direct Costs	Questioned Indirect Costs	Total Questioned Costs	SAO Agreed to Reimburse
1) Unallowable Software Expenses	██████	Unallowable Video Conferencing Licenses	\$2,250	\$246	\$2,496	\$0
2) Non-Compliance with Subaward Policies	██████	████████████████████ Subaward	-	-	-	-
	██████	████████████████████ Subaward	-	-	-	-
	██████	████████████████████ Subaward	-	-	-	-
3) Non-Compliance with Mid-scale Reporting Policy	██████	2019-2020 RI-1 Annual Report Not Submitted Timely	-	-	-	-
	██████	2020-2021 RI-1 Annual Report Not Submitted Timely	-	-	-	-
	██████	2021-2022 RI-1 Annual Report Not Submitted Timely	-	-	-	-
Total			<u>\$2,250</u>	<u>\$246</u>	<u>\$2,496</u>	<u>0</u>

Source: Auditor summary of identified exceptions.

APPENDIX D: RECOMMENDATIONS AND CONSIDERATIONS

We recommend that NSF's Director of the Division of Institution and Award Support:

- 1.1. Resolve the \$2,496 in questioned software costs and direct SAO to repay or otherwise remove the sustained questioned costs from its NSF award.
- 1.2 Direct SAO to implement additional screening processes that require procurement or other relevant personnel to verify software licenses are not otherwise available to employees prior to purchasing or renewing software licenses.
- 2.1 Direct SAO to implement a new policy that outlines its current procedures for issuing and monitoring subawards. Updated procedures should reflect SAO's current process for issuing and monitoring subawards or should ensure subawards are issued and monitored in a manner consistent with SI's *Sponsored Project Handbook*.
- 3.1 Direct SAO to implement controls that ensure Mid-scale Program annual reports are submitted on a timely basis, as required per the Research Infrastructure 1 Program Solicitation.

We suggest that NSF's Office Head of the Research Infrastructure Office consider:

- Directing SAO to update its Project Execution Plan to include all recommended elements and/or justifications regarding why those elements are not applicable.

APPENDIX E: GLOSSARY

Allocable cost. A cost is allocable to a particular federal award or other cost objective if the goods or services involved are chargeable or assignable to that federal award or cost objective in accordance with relative benefits received. This standard is met if the cost:

- (a) Is incurred specifically for the federal award.
- (b) Benefits both the federal award and other work of the non-federal entity and can be distributed in proportions that may be approximated using reasonable methods.
- (c) Is necessary to the overall operation of the non-federal entity and is assignable in part to the federal award in accordance with the principles in this subpart. (2 CFR § 200.405).

Return to the term's initial use.

Factors affecting allowability of costs. The tests of allowability of costs under these principles are: they must be reasonable; they must be allocable to sponsored agreements under the principles and methods provided herein; they must be given consistent treatment through application of those generally accepted accounting principles (GAAP) appropriate to the circumstances; and they must conform to any limitations or exclusions set forth in these principles or in the sponsored agreement as to types or amounts of cost items. (2 CFR § 200.403).

Return to the term's initial use.

Allowable cost. Except where otherwise authorized by statute, costs must meet the following general criteria in order to be allowable under federal awards:

- (a) Be necessary and reasonable for the performance of the federal award and be allocable thereto under these principles.
- (b) Conform to any limitations or exclusions set forth in these principles or in the federal award as to types or amount of cost items.
- (c) Be consistent with policies and procedures that apply uniformly to both federally-financed and other activities of the non-federal entity. (2 CFR § 200.403).

Return to the term's initial use.

Area for Improvement. For the purposes of this report, an area for improvement represents a condition that does not constitute the grantee's non-compliance but warrants the attention of the grantee and NSF management.

Return to the term's initial use.

Fringe Benefits. Allowances and services provided by employers to their employees as compensation in addition to regular salaries and wages. Fringe benefits include, but are not limited to, the costs of leave (vacation, family-related, sick, or military), employee insurance, pensions, and unemployment benefit plans. (2 CFR § 200.431).

Return to the term's initial use.

Indirect (F&A) Costs. This refers to those costs incurred for a common or joint purpose benefitting more than one cost objective, and not readily assignable to the cost objectives specifically benefitted, without effort disproportionate to the results achieved. To facilitate equitable distribution of indirect expenses to the cost objectives served, it may be necessary to establish a number of pools of indirect (F&A) costs. Indirect (F&A) cost pools must be distributed to benefitted cost objectives on bases that will produce an equitable result in consideration of relative benefits derived. (2 CFR § 200.56).

[Return to the term's initial use.](#)

Mid-scale RI-1. This program supports either the design or implementation of unique and compelling RI projects. Mid-scale implementation projects may include any combination of equipment, instrumentation, cyberinfrastructure, broadly used large scale datasets and the personnel needed to successfully commission the project. The total cost of current Mid-scale RI-1 projects range from \$400,000 to \$20 million. (NSF 22-637).³⁷

[Return to the term's initial use.](#)

Mid-scale RI-2. This program emphasizes projects that have strong scientific merit, respond to an identified need of the research community, demonstrate technical and managerial readiness for implementation, include a well-developed plan for student training in the design and implementation of Mid-scale research infrastructure, and involve a diverse workforce in Mid-scale facility development, and/or associated data management. The total cost of current Mid-scale RI-2 projects range from \$20 million to \$100 million. (NSF 23-570).

[Return to the term's initial use.](#)

Period of Performance (POP). The time during which the non-federal entity may incur new obligations to carry out the work authorized under the federal award. The federal awarding agency or pass-through entity must include start and end dates of the POP in the federal award. (2 CFR § 200.77).

[Return to the term's initial use.](#)

Proposal & Award Policies & Procedures Guide (PAPPG). Comprises documents relating to NSF's proposal and award process for the assistance programs of NSF. The PAPPG, in conjunction with the applicable standard award conditions incorporated by reference in award, serve as the NSF's implementation of 2 CFR § 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*. If the PAPPG and the award conditions are silent on a specific area covered by 2 CFR § 200, the requirements specified in 2 CFR § 200 must be followed. (NSF PAPPG 20-1).

[Return to the term's initial use.](#)

³⁷ The sampled NSF grant was awarded under NSF 19-537, when the total current cost of Mid-scale RI-1 projects ranged from \$600,000 to \$20 million. However, because NSF 22-637 identifies the current project cost range for Mid-scale RI-1 projects, NSF 22-637 is utilized for the glossary.

Questioned Cost means a cost that is questioned by the auditor because of an alleged violation of a provision of a law, regulation, contract, grant, cooperative agreement, or other agreement or document governing the expenditure of funds; a finding that, at the time of the audit, such cost is not supported by adequate document; or a finding that the expenditure of funds for the intended purpose is unnecessary or unreasonable. (2 CFR 200.1).

[Return to the term's initial use.](#)

Reasonable Cost. A reasonable cost is a cost that, in its nature and amount, does not exceed that which would have been incurred by a prudent person under the circumstances prevailing at the time the decision to incur the cost was made. (2 CFR § 200.404).

[Return to the term's initial use.](#)

Research and Development (R&D) Cluster. A cluster of programs refers to a grouping of closely related programs that share compliance requirements that may be examined during a Single Audit. R&D is one type of cluster and includes all research and development activities performed by a non-federal entity. (2 CFR 200.1).

[Return to the term's initial use.](#)

Research Infrastructure (RI). NSF defines RI as any combination of facilities, equipment, instrumentation, or computational hardware or software, and the necessary human capital in support of the same. (NSF 19-68 and 21-107, Section 1.4.1).

[Return to the term's initial use.](#)

Subawards. An award provided by a pass-through entity to a subrecipient for the subrecipient to carry out part of a federal award received by the pass-through entity. It does not include payments to a contractor or payments to an individual that is a beneficiary of a federal program. A subaward may be provided through any form of legal agreement, including an agreement that the pass-through entity considers a contract. (2 CFR § 200.92).

[Return to the term's initial use.](#)

Unsupported Cost is a cost that is questioned because the auditor found that, at the time of the audit, such cost is not supported by adequate documentation. Unsupported Cost is a subset of and included in Questioned Costs. (2 CFR 200.1).

[Return to the term's initial use.](#)



About NSF OIG

We promote effectiveness, efficiency, and economy in administering the Foundation's programs; detect and prevent fraud, waste, and abuse within NSF or by individuals who receive NSF funding; and identify and help to resolve cases of research misconduct. NSF OIG was established in 1989, in compliance with the *Inspector General Act of 1978*. Because the Inspector General reports directly to the National Science Board and Congress, the Office is organizationally independent from the Foundation.

Obtaining Copies of Our Reports

To view this and any of our other reports, please visit our website at www.nsf.gov/oig.

Connect with Us

For further information or questions, please contact us at OIGpublicaffairs@nsf.gov or 703.292.7100. Follow us on Twitter at [@nsfoig](https://twitter.com/nsfoig). Visit our website at www.nsf.gov/oig.

Report Fraud, Waste, Abuse, or Whistleblower Reprisal

- File online report: <https://www.nsf.gov/oig/report-fraud/form.jsp>
- Anonymous Hotline: 1.800.428.2189
- Email: oig@nsf.gov
- Mail: 2415 Eisenhower Avenue, Alexandria, VA 22314 ATTN: OIG HOTLINE

National Defense Authorization Act (NDAA) General Notification

Pursuant to Pub. L. No. 117-263, § 5274, business entities and non-governmental organizations specifically identified in this report have 30 days from the date of report publication to review this report and submit a written response to NSF OIG **that clarifies or provides additional context** for each instance within the report in which the business entity or non-governmental organizations is specifically identified. Responses that conform to the requirements set forth in the statute will be attached to the final, published report.

If you find your business entity or non-governmental organization was specifically identified in this report and wish to submit comments under the above-referenced statute, please send your response, within 30 days of the publication date of this report, to **OIGPL117-263@nsf.gov**, no later than August 20, 2023. We request that comments be in .pdf format, be free from any proprietary or otherwise sensitive information, and not exceed 2 pages. Please note, a response that does not satisfy the purpose set forth by the statute will not be attached to the final report.