International Ocean Discovery Program

JOIDES Resolution Science Operator

Texas A&M University

FY21 Annual Program Plan to NSF

for the time period

1 October 2020–30 September 2021

Amount proposed FY21: $64,225,389

Respectively submitted to:
National Science Foundation

JOIDES Resolution
Science Operator

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College Station, TX

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Contents

1. Executive summary

Texas A&M University (TAMU) acts as manager and science operator of the research vessel (R/V) *JOIDES Resolution* as a research facility for the International Ocean Discovery Program (IODP). Administrative services in support of *JOIDES Resolution* Science Operator (JRSO) activities are provided by the Texas A&M Research Foundation (TAMRF) through TAMU Sponsored Research Services (SRS).

1.1. Annual Program Plan overview

The complex nature of IODP operations requires Annual Program Plans spanning operational years to establish priorities and allow the procurement of long–lead time equipment and services. The IODP JRSO FY21 Annual Program Plan to the National Science Foundation (NSF) defines the JRSO scope of work for FY21 IODP activities and deliverables that are specifically covered under NSF Cooperative Agreement OCE-1326927. This Annual Program Plan is based on (1) the current mission forecast provided for JRSO by NSF and (2) the JRSO operations schedule approved by the *JOIDES Resolution* Facility Board (JRFB) in May 2019. The scope and budget justification of the activities described in the Annual Program Plan are derived from NSF guidance to JRSO.

The IODP JRSO FY21 Annual Program Plan includes discussion of JRSO goals, responsibilities, and deliverables, the operational schedule, descriptions of planned expeditions, and the organizational structure for science operations and platform operations activities. Section 1 provides budget definitions, assumptions, and directives used to construct the Annual Program Plan. Section 2 describes scheduled FY21 expedition operations. Section 3 covers organizational structure, personnel summary, and Management and Administration tasks. Section 4 provides an overview of subcontracts. Sections 5 through 9 address JRSO goals, deliverables, and budgets by department. Section 10 provides a summary of costs by expense category, a cumulative budget request detail by department, a detailed budget justification, and a table showing cost savings should any of the planned expeditions be canceled.

“Appendix I: JRSO IT security summary” provides information requested by NSF regarding information technology (IT) security policies, procedures, and practices employed by JRSO to protect contractual research and education activities. “Appendix II: recommended IODP JRSO program of insurance” provides information on risk management services provided to JRSO, including insurance policy monitoring, ongoing risk assessments, marine insurance negotiations, and claims settlement.

1.2. JRSO FY21 scope of work

As science operator of the *JOIDES Resolution* research facility, JRSO will provide wireline coring and logging services and technical, science, and engineering support for *JOIDES Resolution* expeditions (Sections 5 and 6); provide IT support, develop data applications, and manage digital databases (Section 7); curate core materials (Section 8); and publish pre- and postexpedition reports and research results (Section 9). These Program activities will be conducted in accordance with direction provided by the Program advisory panels and the JRFB and as outlined in the approved Annual Program Plan.

JRSO activities and deliverables associated with planning and preparation for *JOIDES Resolution* expeditions include conducting long–lead time planning for expeditions scheduled for future fiscal years, providing all necessary environmental assessments, and documenting operational challenges and risks. JRSO postexpedition activities, deliverables, and ongoing operational tasks include expedition reporting, facilitating expedition research, producing technical documentation, and continuing legacy work.

On behalf of JRSO and as outlined in this Annual Program Plan, TAMRF has contracted with ODL AS for the services of the *JOIDES Resolution* and with Schlumberger Technology Corporation (Schlumberger) for the provision of downhole logging equipment and engineering support (Section 4).

1.3. FY21 budget development

NSF guidance

NSF's FY21 mission forecast for JRSO includes guidance to conduct four expeditions in FY21 and a budget upper limit of $65,000,000.

FY21 budget assumptions

The total budget request of $64,225,389 includes costs to support JRSO facility operations; science operations at sea and all costs in support of these operations such as planning, logistics, engineering science support, and so forth; core curation tasks at the Gulf Coast Repository (GCR); publications tasks; shore-based data management tasks; and other costs in support of maintaining US capability for continued scientific ocean drilling by IODP.

Assumptions about the operations schedule are outlined in Section 2. This plan provides JRSO's best-effort estimate of FY21 costs. If additional funds are identified or expected costs can be avoided during the fiscal year, JRSO may, upon consultation with NSF, use these funds to purchase data management system equipment, drilling or science supplies, or high-priority capital replacement items in support of JRSO deliverables.

Fuel price volatility is a major risk factor for completion of the scheduled operations within the stated budget. Assumptions were made using the best available data to determine a prudent estimate for FY21 fuel costs; however, market conditions are subject to fluctuations that may result in a need for supplemental funding during the period of operations.

FY21 budget request

The FY21 JRSO budget summary in Table 1.1 shows the overall budget request by department. The line-item total requested for each department includes only direct costs. Subcontracts to ODL AS and Schlumberger are budgeted in Management and Administration. Cumulative JRSO costs are separated into total direct costs and indirect costs that make up the "grand total" budget.

Table 1.1. JRSO FY20 budget request by department.

Department	Cost
Management and Administration	44,645,431
Science Operations	6,986,533
Technical and Analytical Services	4,658,283
Development, IT, and Databases	1,895,072
Publication Services	1,649,836
JRSO total direct cost	59,835,154
JRSO modified total direct costs	16,885,522
JRSO indirect costs	4,390,235
Grand total JRSO FY21 budget request	**$64,225,389**

2. Expedition operations

This Annual Program Plan is based on the following operations schedule published 10 March 2020 and includes two tie-up periods.

26 August–5 October 2020	Tie-up period
5 October–5 December 2020	Expedition 390: South Atlantic Transect 1
5 December 2020–4 February 2021	Expedition 391: Walvis Ridge Hotspot
4 February–6 April 2021	Expedition 392: Agulhas Plateau Cretaceous Climate
6 April 2021–6 June 2021	Expedition 393: South Atlantic Transect 2
6 June–2 October 2021	Tie-up period

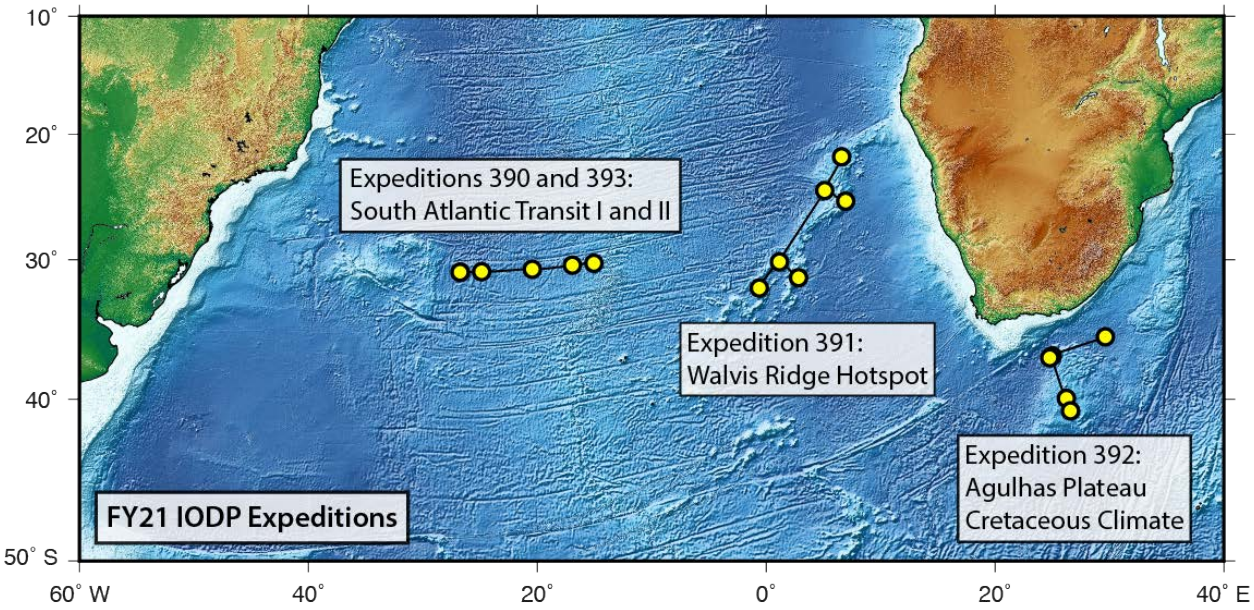

Figure 2.1. FY21 JRSO expedition site map.

2.1. FY21 expeditions

Expeditions 390 and 393: South Atlantic Transect 1 and 2

Proposed operations

The South Atlantic Transect (SAT) is a multidisciplinary scientific ocean drilling project that comprises two IODP expeditions, 390 (October–December 2020) and 393 (April–June 2021). These expeditions will recover complete sedimentary sections and the upper ~250 m of the underlying oceanic crust along a slow/intermediate spreading rate Mid-Atlantic Ridge (MAR) crustal flow line at ~31°S. The sediments along this transect were originally spot cored more than 50 years ago during Deep Sea Drilling Project (DSDP) Leg 3 to help verify the theories of seafloor spreading and plate tectonics. Given dramatic advances in drilling technology and analytical capabilities since Leg 3, many high-priority scientific objectives can be addressed by revisiting the transect. The SAT expeditions will target six primary sites on 7, 15, 31, 49, and 61 Ma ocean crust that will fill critical gaps in our sampling of intact in situ ocean crust with regard to crustal age, spreading rate, and sediment thickness. These sections are required to investigate the history of the low-temperature hydrothermal interactions between the aging ocean crust and the evolving South Atlantic Ocean and quantify past hydrothermal contributions to global geochemical cycles. The transect traverses the previously unexplored sediment- and basalt-hosted deep biosphere

beneath the South Atlantic Gyre, from which samples are essential to refine global biomass estimates and investigate microbial ecosystems' responses to variable conditions in a low-energy gyre and aging ocean crust. The drilling operations will include installation of reentry cones and casing to establish legacy boreholes for future basement hydrothermal and microbiological experiments. The transect is also located near World Ocean Circulation Experiment Line A10, providing access to records of carbonate chemistry and deepwater mass properties across the western South Atlantic through key Cenozoic intervals of elevated atmospheric CO_2 and rapid climate change. Reconstruction of the history of the Deep Western Boundary Current and deepwater formation in the Atlantic basins will yield crucial data to test hypotheses regarding the role of evolving thermohaline circulation patterns in climate change and the effects of tectonic gateways and climate on ocean acidification.

Logistics

Operations for Expeditions 390 and 393 are budgeted based on an estimated 61 days each (390: 3 in port, 13 in transit, and 45 in operations; 393: 5 in port, 13 in transit, and 43 in operations).

Expedition 391: Walvis Ridge Hotspot

Proposed operations

Walvis Ridge (WR) is a long-lived hotspot track that began with a continental flood basalt eruption during the initial opening of the South Atlantic Ocean (~132 Ma). WR stretches ~3300 km to the active volcanic islands of Tristan da Cunha and Gough, and it was originally paired with Rio Grande Rise (RGR) oceanic plateau. The characteristics of WR indicate that the source of the volcanism is the African large low-shear velocity province. The hotspot interacted with the MAR during its early history, producing WR and RGR through plume-ridge interaction. Valdivia Bank, a WR plateau paired with the main part of RGR, represents heightened hotspot output and may have formed with RGR around a microplate, disrupting the expected hotspot age progression. After producing a relatively uniform composition from ~120 to ~70 Ma, WR split into three seamount chains with distinct compositions around the time that the plume and MAR separated. With ~70 My of spatial zonation, the hotspot displays the longest-lived geochemical zonation known. Currently ~400 km wide with young volcanic islands at both ends, the hotspot track is far wider than other major hotspot tracks. Thus, WR displays global extremes with respect to (1) width of its hotspot track, (2) longevity of zonation, (3) division into separate chains, and (4) plume-ridge interaction involving a microplate, raising questions about the geodynamic evolution of this hotspot track.

Understanding WR is crucial for understanding the global variety of plume systems. To test hypotheses about mantle plume zonation, plume activity around a microplate, and hotspot drift, we will core at six locations along the older ridge to recover successions of basaltic lava flows ranging in age from ~64 to 103 Ma. Samples will help us trace the evolution of geochemical and isotopic signatures as the hotspot track became zoned, offering vital clues about compositional changes of the plume source and important implications for understanding the origin of hotspot zonation. Dating will show the age progression of volcanism both at individual sites and along the ridge, testing whether WR formed as a strictly age-progressive hotspot track and whether Valdivia Bank formed as a plume pulse, extended volcanism around a microplate, or possibly even a continental fragment. Paleomagnetic data will track paleolatitude changes of the hotspot, testing whether hotspot drift or true polar wander, or both, explain changes in paleolatitude.

Logistics

Operations for Expedition 391 are budgeted based on an estimated 61 days (5 in port, 11 in transit, and 45 in operations).

Expedition 392: Agulhas Plateau Cretaceous Climate

Proposed operations

The long-term climate transition from the Cretaceous greenhouse to the late Paleogene icehouse provides an opportunity to study changes in Earth system dynamics associated with large changes in global temperature and atmospheric CO_2 levels. Elevated CO_2 levels during the mid-Cretaceous super greenhouse interval (~95–80 Ma) resulted in low meridional temperature gradients, and oceanic deposition during this time was punctuated by widespread episodes of severe anoxia, termed oceanic anoxic events, resulting in enhanced burial of organic carbon in conjunction with transient carbon isotope and temperature excursions. The prolonged interval of mid-Cretaceous warmth and subsequent Late Cretaceous–Paleogene climate trends, as well as intervening short-lived climate excursions, are poorly documented in the southern high latitudes. Expedition 392 aims to core five sites in the southwest Indian Ocean on the Agulhas Plateau and in the Transkei Basin, positioned at paleolatitudes of 65°–58°S during the Late Cretaceous (100–66 Ma) and in the new and evolving gateway between the South Atlantic, Southern Ocean, and southern Indian Ocean basins. Recovery of basement rocks and expanded sedimentary sequences from the Agulhas Plateau and Transkei Basin will provide a wealth of new data to (1) determine the nature and origin of the Agulhas Plateau and (2) significantly advance the understanding of how Cretaceous temperatures, ocean circulation, and sedimentation patterns evolved as CO_2 levels rose and fell and the breakup of Gondwana progressed. Importantly, Expedition 392 drilling will test competing hypotheses concerning Agulhas Plateau large igneous province formation and the role of deep ocean circulation changes through southern gateways in controlling Late Cretaceous–Paleogene climate evolution.

Logistics

Operations for Expedition 392 are budgeted based on an estimated 61 days (5 in port, 6 in transit, and 50 in operations).

2.2. Expedition outreach

Berths will be made available for Onboard Outreach Officers during each expedition, and JRSO personnel will facilitate their activities; give port call tours; and work with the US Science Support Program (USSSP), the IODP Science Office, the IODP Forum, and the TAMU College of Geosciences on diversity and education issues and to further advance the Program through outreach.

3. Management and Administration

3.1. Organizational structure

JRSO's organizational structure directly reflects the responsibilities specified by NSF for technical and scientific management, administration, and operation of the *JOIDES Resolution*, including planning, coordinating, overseeing, reviewing, and reporting activities. The TAMU portion of the organization consists of four departments: Science Operations (SciOps); Technical and Analytical Services (TAS); Development, IT, and Databases (DITD); and Publication Services (Pubs). Managers of these departments report to the

JRSO Director, who is responsible for the Program's overall management and performance. The Human Resources and Curation groups are part of the Director's Office.

On-site administrative staff members dedicated to JRSO support are overseen by a General Manager who reports to the Executive Director of TAMU SRS. This separate reporting chain ensures that the administrative unit retains the independence to ensure regulatory compliance while working directly with JRSO staff to efficiently implement the Program. The Director's Office and the Administrative Services group combined make up the Management and Administration portion of this Annual Program Plan.

On behalf of JRSO, and as outlined in this Annual Program Plan, TAMRF has contracted with ODL AS for the services of the *JOIDES Resolution* for use as the JRSO riserless drilling vessel and with Schlumberger for the provision of wireline logging equipment and engineering support (Section 4).

3.2. Personnel summary

The personnel summary table below presents an accounting of the cumulative estimated effort within each department. The table reflects actual senior personnel and departmental staffing as of 28 February 2020 plus projected staffing for FY21. Staffing levels may change annually due to unanticipated changes in the operations schedule and/or scope of work. The table does not show student workers or the dedicated Administrative Services, IT, and applications developer positions that are supported through indirect costs.

Table 3.1. FY21 personnel summary

Department/ senior personnel	Position titles	Personnel (#)
Management and Administration		7
Brad Clement	Director	1
	Curator	1
	Superintendent of Gulf Coast Repository	1
	Curatorial Specialists	2
	XRF Laboratory Manager	1
Michele Lacey	General Manager, JSRO Administrative Services	1
Science Operations		26
Mitch Malone	Assistant Director and Manager of Science Operations	1
	Administrative Coordinator	1
	Clearance and Permitting Specialist	1
	Supervisor of Engineering and Logistics Support	1
	Staff Engineers	2
	Designers	3
	Staff Researcher	1
	Marine Logistics Coordinator	1
	International Shipping and Receiving Coordinator	1
	Materials Technician	1
	Supervisor of Operations	1
	Operations Superintendent	1
	Operations Engineer	1
	Materials Specialist	1
	Supervisor of Science Support	1
	Expedition Project Manager/Staff Scientist	8

Note: Continued on next page.

Table 3.1. FY21 personnel summary, continued.

Department/ senior personnel	Position titles	Personnel (#)
Technical and Analytical Services		35
Gary Acton	Manager of Technical and Analytical Services	1
	Business Coordinator	1
	Supervisor of Analytical Systems	1
	Imaging Specialists	2
	Supervisor of Technical Support	1
	Laboratory Officers	3
	Assistant Laboratory Officers	4
	Marine Laboratory Specialists (Research Associates/ Research Specialists)	18
	Marine Instrumentation Specialists	4
Development, IT, and Databases		4
Jim Rosser	Manager of Development, IT, and Databases	1
	Supervisor of Databases and Archives	1
	Software Applications Developer III	1
	Data Analyst	1
Publication Services		19
Lorri Peters	Manager of Publication Services	1
	Supervisor of Editing	1
	Editors	4
	Publications Coordinator	1
	Business Coordinator	1
	Supervisor of Production	1
	Production Editors	4
	Supervisor of Graphics	1
	Graphics Specialists	5
Total FY21 JRSO personnel		**91**

3.3. Management and Administration goals

Management and Administration goals include planning, coordinating with other IODP-related entities, and overseeing, reviewing, and reporting IODP activities.

3.4. Management and Administration deliverables in FY21

Program planning

Develop and ensure implementation of Annual Program Plans.

Progress reporting

Provide content for and submit quarterly and annual reporting deliverables, including financial reports.

Reporting and liaison activities

Report to and liaise with funding agencies and with IODP-related agencies (e.g., the JRFB, JRFB advisory panels, Program Member Offices [PMOs], and other national organizations and facility boards). Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate.

Project portfolio management

Manage large cross-departmental tasks and projects through teams using a formal project portfolio management approach to identify, categorize, review, evaluate, select, and prioritize proposed projects.

Compliance support

Ensure compliance with university, state, and US federal statutes and rules governing research, including US export control regulations for all materials shipped to the *JOIDES Resolution*, including third-party instruments, and all scientific personnel sailing during a JRSO expedition.

Contract services

Provide contract services for IODP-related activities, including negotiation, management, and contractual oversight of subcontracts.

Other administrative services

Manage payroll, travel, procurement, invoicing, financial and subcontract reporting, equipment inventory, and risk management services for the Program.

Human resources management

Assist with management and supervision of JRSO staff to ensure adherence to TAMU's policies and procedures for maintaining a well-trained and productive workforce and safe work environment.

Legacy documentation

Routinely archive electronic copies of documents and reports produced by JRSO on behalf of IODP.

4. Subcontractors

The Administrative Services department manages subcontracts by implementing established policies and procedures that ensure compliance with the applicable laws, regulations, provisions, and obligations of the NSF cooperative agreement with JRSO. Establishment of subcontracts involves developing a detailed scope of work that outlines the operational responsibilities of the subcontractor, reviewing subcontractors' policies and agreements to ensure that applicable flow-down regulations are incorporated into any subagreements (e.g., shipboard catering), and monitoring subcontractors' adherence to the established scope of work through direct supervision, periodic meetings, and review of progress reports. Administrative Services staff review subcontractor invoices prior to payment and conduct periodic audits of subcontractors' financial records to ensure financial compliance with cost allowability and other contractual requirements.

4.1. Overseas Drilling Limited AS

ODL AS is responsible for safely conducting drilling and coring operations to meet the scientific goals outlined in the Annual Program Plan. These responsibilities include providing the marine crew, the drilling crew, and complete logistical requirements (i.e., ship supplies, drilling supplies, spare parts, and port call–related activities) in accordance with the approved Operations Plan. The JRSO Operations Superintendent monitors ODL AS adherence to their scope of work on board the *JOIDES Resolution*. In

addition, JRSO SciOps staff review the required daily operations report that details logistical, scientific, and operational data. Expedition planning and crossover meetings held with ODL AS also ensure that the subcontractor adheres to the scope of work and scientific objectives. Review of ODL AS policies and agreements related to catering, travel, and purchasing ensure that applicable flow-down regulations are incorporated. Thorough review of invoices submitted prior to payment and periodic audit of ODL AS financial records ensure financial compliance with cost allowability and other contractual requirements.

4.2. Schlumberger Technology Corporation

Schlumberger provides wireline logging services associated with the design, installation, and operation of logging infrastructure on board the *JOIDES Resolution* to meet the scientific goals outlined in the Annual Program Plan. Two logging technicians sail on a rotating basis, working directly with JRSO staff throughout the expedition and assisting with logging projects on shore. This integration embeds logging operations in the SciOps department's approach to planning, ensuring the Program's goals are met in accordance with the approved operations plan and subcontract agreement. Detailed review of invoices submitted prior to payment ensures financial compliance.

4.3. Rutgers-IODP Core Repository

The Rutgers-IODP Core Repository archives cores obtained during ODP Legs 150X and 174AX. These cores are currently being used to answer questions pertaining to the Paleocene/Eocene Thermal Maximum, Cretaceous/Paleogene mass extinction, Cenozoic sea level change, and Holocene sea level rise. The Rutgers-IODP Core Repository maintains the cores, fills sampling requests, hosts visitors, maintains and improves databases related to these cores, and uses these cores in outreach to undergraduates, graduate students, and other geologists.

5. Science Operations

5.1. Science Operations goals

The SciOps department provides scientific, operational, engineering, and logistical planning and implementation for *JOIDES Resolution* drilling expeditions in response to the IODP science planning structure. SciOps goals include leading the scoping, planning, and implementation of science expeditions; interacting with and providing oversight to the drilling and logging subcontractors; conducting long-range operational planning for out-year JRSO expeditions; and utilizing IODP resources to oversee engineering development projects.

5.2. Science Operations deliverables in FY21

Drilling proposal evaluation

Scope proposals and conduct risk assessment for proposed expeditions.

Risk management

Engage a panel of experts (the TAMU Safety Panel) to participate in site reviews with the Environmental Protection and Safety Panel (EPSP) to provide independent recommendations to JRSO regarding drilling safety and environmental protection.

Expedition planning and implementation

Provide scientific, engineering, operational, and logistical planning and execution for each scheduled expedition; interact with and provide oversight to the drilling subcontractor (ODL AS) and wireline logging subcontractor (Schlumberger); manage rig instrumentation; perform and oversee drilling, logging, and coring operations; plan and implement large projects; and conduct long-range operational and science planning for out-year expeditions.

Expedition staffing

Provide selection and support for scientific staffing and Co-Chief Scientist selection for each scheduled JRSO expedition.

Logistics support

Provide for expedition and shore-based activities including procurement, shipping, and inventory of equipment and supplies.

Clearance/Environmental assessment

Obtain permits and clearances to drill in US waters as well as the Exclusive Economic Zones, Extended Continental Shelves, and territorial waters of potentially any coastal country; provide for environmental assessment services for protected species permitting associated with seismic operations; and ensure environmental protection and safety.

Engineering support

Provide engineering support for maintaining and developing shipboard and shore-based drilling, coring, logging, and downhole systems, including third-party developments and long–lead time borehole installation projects, for each scheduled JRSO expedition.

Scientific leadership

Provide scientific leadership within JRSO for expeditions, projects, and Laboratory Working Groups and provide scientific leadership on board the *JOIDES Resolution* during expeditions.

Progress reporting

Provide expedition-related reports and content for expedition publications (e.g., *Scientific Prospectus*, *Preliminary Report*, etc.). Provide content for shipboard and shore-based reporting deliverables (e.g., daily and weekly ship reports, site summaries, and JRSO quarterly and annual reports).

Liaison activities

Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate.

Education/Outreach support

Facilitate activities of Onboard Outreach Officers, give port call tours, and participate in efforts to further advance the Program through outreach.

Legacy documentation

Routinely archive electronic copies of documents and reports produced by JRSO on behalf of IODP, including expedition science and operations reports.

6. Technical and Analytical Services

6.1. Technical and Analytical Services goals

The TAS department oversees the laboratories and facilitates core curation, handling, and shipping. TAS stocks, maintains, upgrades, and staffs the shipboard and shore-based laboratories. TAS goals include managing the complex supply chain for stocking the shipboard laboratories; operating scientific instruments and providing support to shipboard scientists in making scientific measurements; educating scientists about laboratory-specific and general shipboard safety requirements; maintaining, repairing, and developing scientific equipment and laboratories while at sea to enable expedition staff to meet scientific objectives; providing support for downhole tools and measurements; establishing quality assurance/quality control (QA/QC) for measurements made in the laboratories; and supporting shore-based laboratories.

6.2. Technical and Analytical Services deliverables in FY21

Analytical systems

Support and maintain shipboard and shore-based analytical facilities, tools, instruments, and associated QA/QC protocols.

Laboratory working groups

Provide oversight, research direction, and advice on corrective actions and potential developments for laboratories and QA for the methods, procedures, and analytical systems both on the *JOIDES Resolution* and on shore through regular review of cruise evaluations, expedition technical reports, issues management communications, and interactions with members of the science community.

Shipboard laboratory support

Ensure shipboard laboratory safety, handle core, oversee and assist in shipboard analytical measurements, manage and troubleshoot issues in the shipboard laboratories, ensure effective capture and transfer of expedition data to database systems, manage supply chain for shipboard consumables, and support Science Parties in achieving scientific objectives.

Scientific leadership

Provide scientific leadership within JRSO for project management and in Laboratory Working Groups.

Progress reporting

Provide content for reporting deliverables (e.g., JRSO quarterly and annual reports).

Liaison activities

Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate.

Education/Outreach support

Facilitate activities of Onboard Outreach Officers, give port call tours, and participate in efforts to further advance the Program through outreach.

Legacy documentation

Routinely archive electronic copies of documents and reports produced by JRSO on behalf of IODP.

7. Development, IT, and Databases

7.1. Development, IT, and Databases goals

The DITD department oversees JRSO data collection/storage, management, and archiving; maintains IT infrastructure on ship and shore; develops and maintains instrument-specific software for data acquisition and dissemination; and manages the Programs' extensive databases.

DITD goals include managing data supporting IODP activities, managing expedition and postexpedition data, providing long-term archival access to data, and supporting IT services.

7.2. Development, IT, and Databases deliverables in FY21

Expedition data services

Maintain and manage databases that support expedition planning and data collected during expeditions, operate and maintain data management and harvesting systems (including QA/QC for storage and archival of expedition and postexpedition data, such as core and sample tracking), ensure data integrity, respond to data requests from the scientific community, and plan data handling for special/third-party science equipment.

Program-wide data query services

Provide JRSO customers with access to expedition databases and data using web-based services.

Operation and maintenance

Operate and maintain computer and network systems both on ship and on shore; maintain IT infrastructure, including satellite communications, personal computers, and network instrumentation hosts; and, to the extent possible, maintain congruency between ship and shore system architectures.

IT service support

Provide help desk services and support IT needs of visiting scientists.

Security services

Monitor and protect JRSO network and server resources to ensure safe, reliable operation and security for IODP data and IT resources.

Software development

Provide software development services as needed, maintain software, and provide training support for shipboard scientists as necessary.

Project Portfolio Management

Administer the JRSO project portfolio management program.

Reporting

Provide content for reporting deliverables (e.g., JRSO quarterly and annual reports). Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate.

Expedition outreach

Support outreach activities at sea by providing access to internet collaboration services such as ship-to-shore web conferencing.

Documentation

Maintain electronic copies of all IT architecture and corresponding services configurations.

8. Core Curation

8.1. Core Curation goals

The Core Curation unit's major responsibilities are to curate, archive, and manage cores and samples collected by the Program. Core Curation goals include providing pre-expedition and shipboard curatorial services; postexpedition services including Sample Allocation Committee (SAC) support, sample parties, and post moratorium sampling; X-ray fluorescence (XRF) scanning services including programmatic and personal measurements and digital imaging; core storage and preservation; and educational use of the core collection including tours and use of the repository for classes and workshops.

8.2. Core Curation deliverables in FY21

Sample and curation policy and procedures

Work with other IODP facilities and the IODP advisory panel to review and revise the IODP Sample, Data, and Obligations Policy as needed and implement a policy for IODP core curation. Work closely with staff to coordinate, standardize, and document curatorial procedures for IODP cores and samples. Work with DITD and TAS to develop new software solutions designed to replace the curation software application SampleMaster.

Sample and curation strategies

Plan sample and curation strategies for upcoming JRSO expeditions and review all shipboard and moratorium-related requests in coordination with the other members of SAC for each expedition. Coordinate with the SAC and plan and execute shore-based sample parties for cores ultimately stored at the GCR and Kochi Core Center (KCC). Assist with Bremen Core Repository (BCR) sample parties.

Core sampling

Provide a curatorial specialist on board the *JOIDES Resolution* to develop, coordinate, and execute site-sampling plans and supervise core sampling during ship operations.

Core curation and sample requests

Conduct all responsibilities associated with curating core collections at the GCR and supporting core sampling, analysis, and education; fulfill postmoratorium sample requests from the scientific community; and provide technical expertise in interactions with KCC and BCR in support of sampling and curating core material obtained from NSF-funded scientific ocean drilling and housed at the KCC and BCR.

Use of core collection and education and outreach support

Promote outreach use of the core collection in collaboration with Institute for Marine-Earth Exploration and Engineering (MarE3) (previously known as Center for Deep Earth Exploration [CDEX]) and European Consortium for Ocean Research Drilling (ECORD) Science Operator (ESO) education/outreach personnel and other science partners by providing materials for display at meetings or museums, conducting tours, and supporting other JRSO outreach activities.

Onshore XRF scanning

Provide support and oversight of the XRF scanning laboratory at the GCR. Train users in the basic operation of the equipment. Develop models for optimizing data interpretation; provide pre- and postanalysis support. Support high-resolution digital imaging.

Progress reporting

Provide content for reporting deliverables (e.g., JRSO quarterly and annual reports).

Liaison activities

Act as a liaison to IODP advisory and other panels, task forces, and workshops as appropriate. Participate in annual IODP curatorial staff meeting.

Core storage and preservation

Maintain and, where possible, improve the core storage facility. Receive, sort, and store core and residue shipments from the *JOIDES Resolution*, including temporary storage of KCC and BCR cores (shipped from the *JOIDES Resolution* for XRF scanning). Coordinate core shipments to the KCC. Shrink-wrap and maintain the collection.

Legacy documentation

Routinely archive electronic copies of documents and reports produced by JRSO on behalf of IODP.

9. Publication Services

9.1. Publication Services goals

The Pubs department is responsible for producing IODP scientific publications, from pre-expedition planning documents (i.e., *Scientific Prospectus*es) to postexpedition *Proceedings* volumes, technical documentation (policies and procedures), and Program reporting deliverables, along with bibliographic and citation management.

Pubs goals include providing publications support services for JRSO drilling expeditions and editing, production, and graphics services for all required reports and scientific publications as defined in the JRSO cooperative agreement with NSF. IODP publications for FY21 will include quarterly and annual reports for JRSO and a *Scientific Prospectus*, *Preliminary Report*, and *Proceedings of the International Ocean Discovery Program* volume and data reports for each JRSO, ESO, and MarE3 expedition.

9.2. Publication Services deliverables in FY21

Shipboard publications support

Provide a Publications Specialist for publications support and report coordination during each FY21 JRSO and ESO expedition.

Postexpedition editorial meetings

Provide editorial, graphics, and production support during JRSO, ESO, and MarE3 postexpedition editorial meetings.

IODP scientific publishing

Produce scientific reports for JRSO, ESO, and MarE3 (*Scientific Prospectuses* and *Preliminary Reports*) and expedition reports *Proceedings* volumes for JRSO, ESO, and MarE3 expeditions that will be either published or in production during FY21.

Publications coordination

Manage the peer-review process for Integrated Ocean Drilling Program and IODP *Proceedings* data reports and synthesis papers and provide centralized recordkeeping of Integrated Ocean Drilling Program and IODP postexpedition research submissions and publications in outside literature; track shipboard party publication obligations and reviewer activities.

Website maintenance

Maintain and manage the ship and shore websites (http://iodp.tamu.edu, http://publications.iodp.org, and http://www.ship.iodp.tamu.edu) and legacy websites (http://www.odplegacy.org, http://www-odp.tamu.edu/publications, and http://www.deepseadrilling.org).

Bibliography and citation management

Manage postexpedition publication citation records, maintain cumulative Program and expedition-related bibliographies, prepare annual report of Program-related citation statistics, and respond to special requests for Program-related citation data.

Discovery and accessibility

Maintain and update IODP publications and expedition-related research collections at ScienceOpen researcher portal, TAMU Elements database, and EBSCO information services and register extended metadata (including author ORCiDs, licensing, funding, and reference information) at CrossRef.

Publication archiving

Maintain the print archive of DSDP and ODP publications at HathiTrust and the digital archive of DSDP, ODP, Integrated Ocean Drilling Program, and IODP publications at the Internet Archive.

Progress reporting

Edit and produce the JRSO FY20 Quarter 4 report, three JRSO FY21 quarterly reports, the JRSO FY20 Annual Report, and the JRSO FY21 Annual Program Plan, including original versions and all revisions required by NSF.

Expedition outreach

Facilitate activities of Onboard Outreach Officers during JRSO expeditions.

Legacy and technical documentation

Routinely archive electronic copies of all documents, reports, technical documentation, and scientific publications produced by the JRSO on behalf of IODP.

Integrated Ocean Drilling Program closeout activities

Complete and archive expedition publications (e.g., publish data reports and synthesis papers in the *Proceedings of the Integrated Ocean Drilling Program* and update expedition-related citation lists associated with Integrated Ocean Drilling Program legacy program expeditions).

10. JRSO FY21 budget

The budget summary and detailed departmental budgets in this section describe the overall JRSO FY21 budget requests to provide a framework for interpreting fiscal data in quarterly reports delivered to NSF by JRSO.

Table 10.1 provides the cumulative total for each major expense category in the JRSO FY21 budget, Table 10.2 shows the detailed budget request for each department, and Section 10.1 outlines the potential cost savings by expedition that would result from elimination of a scheduled expedition. The budget explanation for each expense category is provided in Section 10.2.

Table 10.1. FY21 expense category summary.

Expense category	Cost
Salaries and fringes	9,934,572
Equipment	585,775
Travel	1,033,500
Materials and supplies	2,300,243
Consultant/professional services	393,079
Computer services	80,000
Subcontracts	42,363,857
Other direct costs	3,144,128
Shipping	592,899
Communication	83,746
Business conferences	31,000

Note: Continued on next page.

Table 10.1. FY21 expense category summary, continued.

Expense category	Cost
Training	175,414
Insurance	633,328
Maintenance and repair	1,339,290
Other	288,451
JRSO total direct costs	**59,835,154**
JRSO total modified direct costs	16,885,522
JRSO indirect costs	4,390,235
Grand total JRSO FY21 budget request	**$64,225,389**

Table 10.2. FY21 JRSO budget detail by department.

Department/expense category	Cost
Management and Administration	
Salaries and fringes	1,056,500
Equipment	11,000
Travel	164,800
Materials and supplies	92,200
Consultant/professional services	63,036
Computer Services	80,000
Subcontracts	42,363,857
Overseas Drilling Limited	38,559,651
Day rate	29,742,535
Fuel and lubricants	4,238,420
Per diem	670,634
Port calls	1,595,000
Travel—ODL AS	942,000
Insurance—*JOIDES Resolution*	738,694
Other	672,368
Schlumberger Technology Corporation	3,698,741
Day rate	3,479,841
Supplies	15,000
Shipping	10,000
Travel	32,000
Equipment rental	79,400
Maintenance and repair	82,500
Rutgers-IODP Core Repository	65,465
Salaries and fringes	40,832
Materials and supplies	1,000
Other	2,234
Indirect costs	23,633
Other direct costs	814,038
Shipping	24,150
Communication	77,254
Business conferences	31,000
Training	28,140
Insurance	621,328
Maintenance and repair	9,000

Note: Continued on next two pages.

Table 10.2. FY21 JRSO budget detail, continued.

Department/expense category	Cost
Other	23,166
Total Management and Administration direct costs	**44,645,431**
Science Operations	
Salaries and fringes	3,381,411
Equipment	38,000
Travel	223,500
Materials and supplies	1,533,038
Consultant/professional services	180,700
Computer Services	0
Subcontracts	0
Other direct costs	1,629,884
Shipping	561,749
Communication	780
Training	11,980
Insurance	12,000
Maintenance and repair	797,600
Other	245,775
Total Science Operations direct costs	**6,986,533**
Technical and Analytical Services	
Salaries and fringes	3,426,333
Equipment	360,000
Travel	423,500
Materials and supplies	311,000
Consultant/professional services	3,000
Computer Services	0
Subcontracts	0
Other direct costs	134,450
Shipping	6,800
Communication	0
Training	50,250
Maintenance and repair	77,000
Other	400
Total Technical and Analytical Services direct costs	**4,658,283**
Development, IT, and Databases	
Salaries and fringes	533,242
Equipment	176,775
Travel	168,900
Materials and supplies	343,255
Consultant/professional services	130,593
Computer Services	0
Subcontracts	0
Other direct costs	542,306
Shipping	200
Communication	5,712
Training	62,544

Note: Continued on next page.

Table 10.2. FY21 JRSO budget detail, continued.

Department/expense category	Cost
Maintenance and repair	455,690
Other	18,160
Total Development, IT, and Databases direct costs	**1,895,071**
Publication Services	
Salaries and fringes	1,537,086
Equipment	-
Travel	52,800
Materials and supplies	20,750
Consultant/professional services	15,750
Computer Services	0
Subcontracts	0
Other direct costs	23,450
Shipping	0
Training	22,500
Other	950
Total Publication Services direct costs	**1,649,836**
JRSO total direct costs	59,835,154
JRSO total modified total direct costs	16,885,522
JRSO indirect costs	4,390,235
Grand total JRSO FY21 budget request	**$64,225,389**

10.1. Expense category definitions

Salaries and fringe benefits

Salaries, fringe benefits, and sea pay, including an anticipated cost-of-living allowance for staff supporting the Program (see Table 3.1). Fringe rates are calculated based on actual costs.

Equipment

Procurement, upgrade, or fabrication of operational equipment with an acquisition cost of more than $5,000, including tools and equipment in support of logging operations and computer and network equipment to replace aged network models, workstations, and plotters as well as new workstations for new staff. Costs associated directly with equipment (computer, scientific, and drilling) intended solely for use on the ship over a period of time greater than one expedition, equipment purchased for a specific expedition, and the pro rata cost of shore-based equipment used partially to support expedition activities. Operational equipment replacement and acquisition of parts and spare units for downhole tools. Acquisition of new analytical systems and capital replacement or upgrades of failed or obsolete laboratory equipment. Estimated equipment costs are projected based on potential for loss during operations and the need for replacement and are calculated using current quotes on file.

Travel

Transportation, per diem, lodging, and other associated costs.

Domestic

Travel to IODP meetings and workshops, pre- and postexpedition planning meetings; subcontractor, insurance, and vendor meetings; and professional conferences. Travel costs to bring off-site JRSO staff to participate in on-site meetings. Costs are estimated at $1,500 per domestic trip based on the current published government per diem rates.

International

Travel for personnel attending international Program meetings and workshops and for personnel who will work at port calls, sail during expeditions, and/or work on the ship during transits or tie-up periods. Costs are estimated at $5,000 for regular meetings and $4,500 for port calls/expeditions based on the expedition schedule, the current published government per diem rates, and estimated air travel costs specific to the port call location.

Materials and supplies

Operational, engineering, laboratory, and logistical supplies for shipboard and shore-based analytical and engineering laboratory and test facilities and expeditions, including long–lead time hardware for FY22 expeditions. Cost estimates for drill and core bits, core liner, hardware, bulk materials, and coring supplies are calculated based on expedition-specific requirements such as estimated penetration, core recovery, lithology, and potential hole instability. Standard reference material; shipboard laboratory consumables and safety supplies; specialized supplies for core sampling and curation tasks; expendables and small hardware for continued operation and maintenance of IT resources; digital photographic supplies for processing images on shore; general operational and office supplies, including printer and copier supplies and paper; noninventory equipment costing less than $5,000; software purchases and upgrades, software subscriptions, volume licensing agreements, concurrent usage software agreements, electronic media, and other computer supplies; costs of office furniture, including replacing broken or aging furniture; and general safety and cleaning supplies.

Consultant/professional services

Costs for expert assistance, including annual physical examinations for seagoing personnel, external printing and copier services, vehicle and warehouse equipment repair, testing and calibration of laboratory instruments and equipment, machine shop services, oversight of inspection and refurbishment of drill pipe, environmental evaluations, facilities repair, lease of off-premises records storage facility, visitor parking permits, back-up services, IT expert assistance services, TAMU Physical Plant services, temporary labor, tuition for graduate assistant non-teaching (GANT) positions, transfer fees, and weather reports. Consultant and contract services, including services in support of network and videoconferencing equipment, engineering evaluation services as needed, and liaisons to selected panels as needed. American Geosciences Institute (AGI) Scientific Ocean Drilling Bibliographic Database fee for inclusion of new citations, Science Open fee for featuring publications, CrossRef annual membership and administrative costs, digital object identifier (DOI) registration charges, CrossMark registration charges, and publications archiving fees.

Computing services

Use of TAMU's financial and management information system (FAMIS), including the Program's share of costs based on the number of entry lines.

Subcontracts

Consultant and contract services.

ODL AS

Subcontract for operations of the *JOIDES Resolution*. Costs related to this subcontract include the following.

Day rate

Vessel staffing for the subcontractor's sailing crew and drilling personnel, not including the cost of JRSO personnel or scientists aboard the ship. The day rate varies according to the mode of the ship, which is operating (drilling or cruising) or standby (in port). Although it is a fixed rate per day, the day rate is adjusted for changes in the Consumer Price Index-Urban (CPI-U) and Employment Cost Index (ECI). The budgeted amount is based on 365 days, including one extended port call/tie-up period, and allows for one CPI-U adjustment and two ECI adjustments of 2.25% each. The anticipated operating/cruising and standby day rates, respectively, are $80,004.18 and $77,378.99 through 31 March 2021, adjusted to $80,382.20 and $77,744.60 through 30 June 2021, and adjusted to $81,539.70 and $78,864.12 for the remainder of the fiscal year.

In addition to the day rate described above, a separate supplemental day rate of $2,000 is included in the budget. It represents IODP's contribution to the estimated costs for major dry dock activities scheduled to occur in FY24 that are required after a vessel has been in service for 45 years. The supplemental day rate is expected to remain in effect through 30 September 2024 and will not be subject to escalation by movement of the CPI-U or ECI.

Fuel and lubricants

Fuel to be purchased for the riserless vessel is estimated at a total of 6,000 metric tons (mt) of Marine Gas Oil (MGO), which includes 1,000 mt, 1400 mt, and 1,000 mt at Cape Town, South Africa (three refuelings); 1,100 mt in Rio de Janeiro, Brazil; and 1,500 mt in Buenos Aires, Argentina. Quantities are based on ODL's fuel forecast as of 8 January 2020. All prices per metric ton were obtained from the *Livebunkers* website on February 20, 2020. Because those prices are abnormally low due to the effect of the Caronavirus pandemic on the global economy, a 10% inflation factor was added to FY21 pricing.

Per diem

Shipboard catering costs associated with meals and berthing on the vessel and cleaning of the laboratory stack. For normal scientific operations it is assumed there will be 60 persons on board (POB). During non-coring transits and tie-up/extended port call periods it is estimated there will only be 15 POB. The lower number of personnel on board for non-coring transits and tie-up periods is based on previous staffing schedules in like circumstances and other information on anticipated staffing requirements obtained from the JRSO Manager of Science Operations. The daily cost per person for 60 POB is $34.72 through 31 December 2020, increasing to $35.59 effective 1 January 2021. A higher rate of $82.95 ($85.02 after 1 January 2021) is charged when the POB count is reduced to 15. This category does not include per diem for the ship subcontractor's sailing crew and drilling personnel because they are accounted for in "Day rate," above.

Port call costs

Vessel port agent's expenses, subcontractor freight, and meals and lodging costs incurred during subcontractor's crew rotations for six port calls scheduled in Cape Town, South Africa (three port calls); Rio de Janeiro, Brazil; a to-be-determined (TBD) location (most likely in Uruguay); and Bueno Aires, Argentina. Duration of each port call is expected to be 5 days, with the exception of the TBD location, which is scheduled for 112 days.

Insurance—*JOIDES Resolution*

Annual insurance premiums for subcontractor and TAMRF, including subcontractor's premium costs for All Risks Marine Hull and Machinery (H&M) insurance and TAMRF premium costs for Cargo, Equipment, Control of Well, Excess Liabilities, Foreign General Liability, Contingent Auto Liability, Foreign Workers' Compensation, Contractor's Pollution, and Charterers Liability insurance. Also included is coverage for rental of mud motors during Expeditions 390, 391, and 393.

Travel—ODL

Subcontractor transportation, including airfare for ship subcontractor's crews to/from six scheduled crew changes: Cape Town, South Africa, for Expeditions 391, 392, and 393; Rio de Janeiro, Brazil, and a TBD location for the tie-up period; and Bueno Aires, Argentina, for Expedition 394. The estimate is based on a crew of 60 personnel with various domestic and international originating fly points arriving and departing each port call.

Schlumberger wireline logging subcontractor

Subcontract for the provision of a standard suite of tools, engineer services, software support, mobilization services, and specialty tools as needed; support for a dedicated engineer on the ship for each expedition and support from the base of operations; and the services of a district engineer, staff engineer, electronics technician, and special services engineer as needed. Costs (including shipping charges) related to leasing equipment needed for wireline fishing, back-off and severing services, day rate, and travel expenses for the wireline logging engineer, and day rate for tool insurance for the deployment of downhole logging tools.

Other direct costs

Costs not covered in other categories.

Shipping

Postage, express mail, and freight, including general postage and express mail/courier services for regular correspondence, scientific reports, small packages, and data and photo requests; shipping materials, equipment, and supplies to and from expeditions; regular-sized sample shipments to scientists; and costs for special shipments of deep-frozen microbiological samples, U-channels, and so on. Estimated costs are based on historical averages of similar shipments for standard items sent to the ship for each expedition and expedition-specific items.

Communication

Standard telephone line, long distance, and fax charges; cellular phone charges; satellite; and cost of web and video conferencing as needed. Cost for very small aperture terminal (VSAT) communication and Inmarsat communication to and from the *JOIDES Resolution*.

Business conferences

Catering, supply, and incidental costs associated with hosting pre- and postexpedition meetings, EPSP, core sampling events, educational workshops, on-site training events, and visits to the GCR. The cost per meeting is based on the past 3 years' expense data for these meetings. IODP JRSO hosts approximately 21 meetings per year.

Training

Registration, transportation, per diem, and lodging expenses related to professional courses and meetings and online training courses.

Insurance

Annual insurance premiums for JRSO vehicles.

Maintenance and repair

Equipment service agreements and noncontracted maintenance and repair of equipment in warehouse, forklift, overhead cranes, and other loading dock equipment. Inspection and refurbishment of tubulars (drill pipe, knobbies, and outer core barrel components), deep freezers, shrink-wrap and bagging machinery, office equipment, copiers, postage meter, imaging equipment such as cameras, vehicle fleet, and IT computer hardware and software. Drilling, coring, logging, laboratory, repository, and safety equipment.

Equipment rental

Rental of equipment when it is more economical to rent than purchase, including conference equipment, mud motors, and water coolers.

Recruiting and relocation

Employee recruitment costs, including local, internet, and science and trade journal advertisements, and other costs related to filling/replacing positions and recruiting professional staff. Relocation costs for new employees.

Library

Technical books, journals, and other resources, including subscriptions to professional publications and documentation materials required for reference.

Indirect costs

The TAMU off-campus indirect cost rate of 26% modified total direct cost (MTDC) is applied to this cooperative agreement. MTDC is calculated as total direct costs minus costs in exempt categories (e.g., equipment and subcontract costs over $25,000).

Appendix I: IT security summary

Policies and procedures

Texas A&M University's (TAMU's) Information Security Controls Catalog is available at https://it.tamu.edu/policy. Additionally, TAMU Rules and Standard Administrative Procedures are available at http://rules.tamu.edu/TAMURulesAndSAPs.aspx.

The JRSO policy for shipboard communications is available at https://goo.gl/SrILWS.

All employees must take yearly security awareness training as required by TAMU. As part of this training, all users are required to acknowledge that they have read, understand, and will comply with university requirements regarding computer security policies and procedures.

Risk assessment

JRSO completes an annual information security risk assessment report as required by TAMU and the State of Texas. The results are electronically reviewed by the Supervisor of Information Technology & Support, department manager, Director of Science Services, and College of Geosciences Dean and then filed with the TAMU Division of IT Risk Management Office for further assessment and follow-up.

Roles and responsibilities

System Administrator, Marine Computer Specialist, and Service Desk Specialist (departmental IT personnel) responsibilities include

- Applying platform technical safeguards,
- Supplying the first-level response (i.e., restoration services) to any security breach, and
- Immediately reporting any security breach to the Supervisor of Information Technology & Support.
- Supervisor of Information Technology & Support responsibilities include
- Assuring that best practices are followed in the administration of systems;
- Reporting criminal activity under applicable state code concerning computer or telecommunications crimes to the department manager, Director, College of Geosciences Dean, and TAMU's Chief Information Security Officer or designee;
- Determining if a violation rises to the standard of fraud or fraudulent action and reporting it to the department manager, Director, and College of Geosciences Dean; and
- Determining the physical and electronic evidence to be gathered as part of incident investigation such as initiating, completing, and documenting the incident investigation.

Technical safeguards

Departmental IT personnel shall test security patches prior to implementation where practical. Departmental IT personnel are encouraged to have hardware resources available for testing security patches in the case of special applications.

Departmental IT personnel shall ensure that vendor-supplied patches are routinely acquired, systematically tested, and installed promptly based on risk-management decisions.

Departmental IT personnel shall enable security features included in vendor-supplied systems in accordance with best practices, including but not limited to firewalls, virus scanning and malicious code protections, multifactor authentication, and other file protections, where possible. Audit logging shall also be enabled. User privileges shall be set utilizing the "least privileges" concept of providing the minimum amount of access required to perform job functions. Privileges may be added as need is demonstrated by the user. The use of passwords shall be enabled in accordance with TAMU policies referenced below. When feasible, multifactor authentication shall be used by system and network administrators when accessing IT infrastructure with elevated privileges.

Departmental IT personnel shall disable or change the password of default accounts.

Departmental IT personnel or their designee shall test servers, especially for known vulnerabilities, periodically or when new vulnerabilities are announced.

Departmental IT personnel shall seek and implement best practices for securing their particular system platform(s).

Physical safeguards

After business hours, JRSO building entry is allowed via identification (ID)/keycard. Information is logged and available for retrieval at a later date. An access list is maintained by the Building Proctor. Entry into JRSO and TAMU data centers on shore is granted only to authorized personnel whose job responsibilities require access to the facility and to vendors when necessary. JRSO's data center is secured using centrally controlled electronic locks with swipe card access capability. TAMU's data center is secured 24/7 using biometric access capability and armed guard(s).

Data center information

Power to the JRSO data center is provided via 50 kVA uninterruptible power supply (UPS) and matching power distribution unit (PDU). In case of power outage, power is supplied to UPS and backup heating, ventilation, and air-conditioning (HVAC) by a diesel generator. The computer room is protected from fire by a halon fire suppression system.

TAMU's West Campus Data Center is a 50,000 square foot facility with up to 30,000 square feet or raised floor, HVAC services providing 7.4M BTU/h cooling capacity, two 2.5 MW generators for backup power, three uninterrupted power supply (UPS) systems totaling 4,000 kVA, and Very Early Warning Aspirating Smoke Detection (VESDA) and fire suppression systems.

Data backups

Incremental backups are completed on a daily basis, and full backups are completed weekly. One full backup copy is kept locally, and another is removed to off-site storage every 30 days.

Cybersecurity breach notification procedures

In the event of a cybersecurity breach:

1. Departmental IT personnel have information security roles and responsibilities that take priority over normal duties.

2. Departmental IT personnel are responsible for notifying the Supervisor of Information Technology & Support and department manager and initiating the appropriate action, including restoration. The department manager will notify the Director and TAMU's Chief Information Security Officer or designee.
3. Departmental IT personnel are responsible for determining the physical and electronic evidence to be gathered as part of the incident investigation, such as initiating, completing, and documenting the incident investigation.
4. Departmental IT personnel shall report security incidents that may involve criminal activity under their respective state's penal code to TAMU's Chief Information Security Officer or designee.
5. If fraud or theft is suspected as part of security incident detection, the person detecting the incident shall follow their respective system policies concerning the control of fraud and fraudulent actions.
6. If there is a substantial likelihood that security incidents could be propagated to other systems beyond departmental control, Departmental IT shall report/escalate such incidents as soon as an incident is identified.
7. The Supervisor of Information Technology & Support shall send an after-action report to the TAMU Chief Information Security Officer or designee by email to security@tamu.edu.

Security measures for nonemployees

All subcontractors, researchers, and others who have access to the systems employed in support of this contract are required to follow all TAMU and JRSO security policies.

Appendix II: recommended program of insurance

Texas A&M Research Foundation (TAMRF) will utilize the risk management services of Texas A&M University (TAMU), which will include insurance policy monitoring, ongoing risk assessments, marine insurance negotiations, and claims settlement. TAMRF's established relationship with the London insurance market coupled with the Program's safety history have enabled TAMU staff to obtain cost-effective premiums. TAMU staff have used market relationships, attention to detail, and clear communication to educate insurance brokers and underwriters to the specific risks involved in deep-ocean coring and foster an understanding of risk mitigation along with differentiation from the common risks incurred during energy-related drilling.

Premium negotiations include documentation and explanation of specific exposures, estimated payroll costs, estimated operational time, confirmation of valuation, and operational history. As a result of proactive risk management, communication, and education, the Program's premiums have historically averaged less than the energy market, and terms and conditions for insurance coverage have been more favorable than the norm in the energy sector. The premiums in the table below are preliminary estimates subject to underwriter confirmation in FY20.

The FY21 proposed program of insurance for mitigation of drilling risks and marine/employer's liability is depicted in the following table. In addition, TAMU, on behalf of the *JOIDES Resolution* Science Operator (JRSO), will assess specialty risks and procure insurance if warranted.

JRSO FY21 program of insurance details			
Program of insurance with government indemnification	Coverage limits	Deductible	**Estimated annual premiums**
Hull & Machinery and Removal of Wreck[1]	190,000,000	250,000	738,694
Control of Well (COW)	25,000,000	50,000	91,387
Seepage & Pollution Liability[2]	1,000,000	Included in COW	Included in COW
Cargo	5,000,000	25,000	39,734
Third Party Property/Equipment	10,000,000	25,000	31,561
Charterer's Legal Liability	1,000,000	10,000	13,247
Contractor's Pollution Liability—Gradual	10,000,000	1,000,000	27,699
Umbrella	200,000,000	Underlying policy limits	276,750
Worker's Compensation & Maritime Employer's Liability	1,000,000	None	111,204
Comprehensive General & Automobile Liability	1,000,000	None	48,746
Total estimated annual premiums			**$1,379,022**

[1] Carried by ship subcontractor (ODL AS) and reimbursed1 by TAMRF.
[2] Included in Control of Well Policy and covered under the Umbrella.