Facility Condition Assessment of The National High Magnetic Field Laboratory

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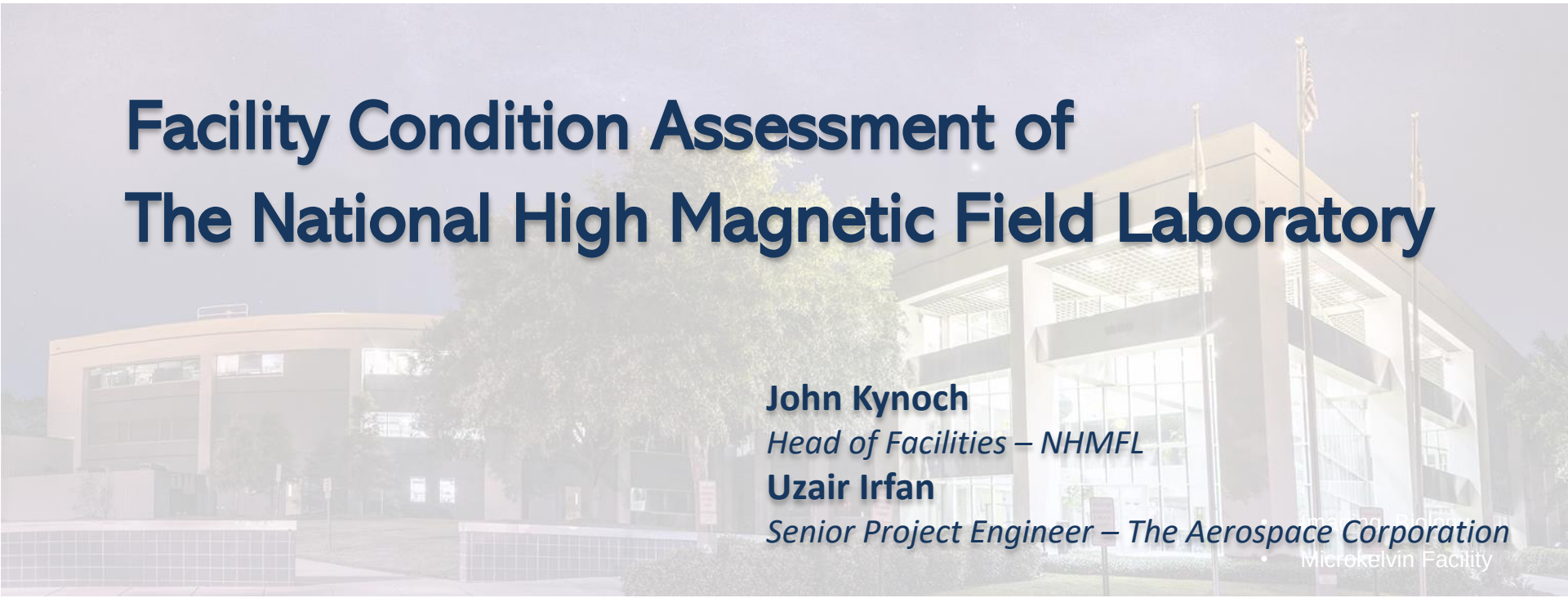
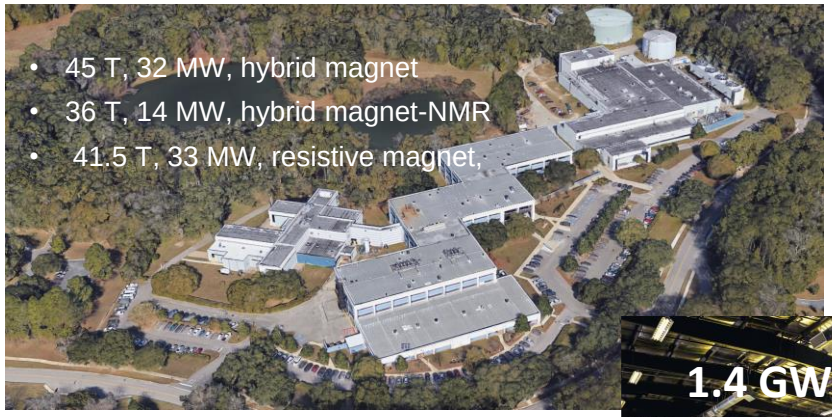


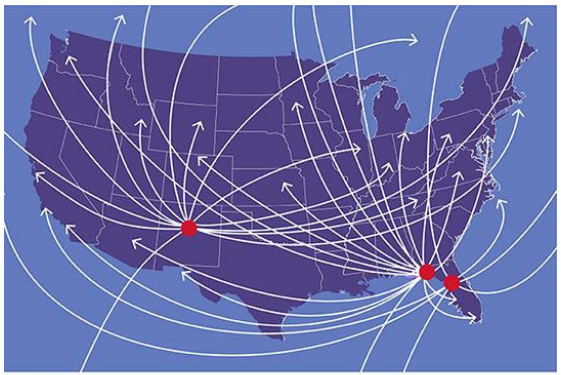
NATIONAL MAGLAB

3 Sites
7 User Facilities
500,000 square feet



FLORIDA STATE UNIVERSITY

Los Alamos NATIONAL LABORATORY



FLORIDA STATE UNIVERSITY | UF UNIVERSITY of FLORIDA | Los Alamos NATIONAL LABORATORY

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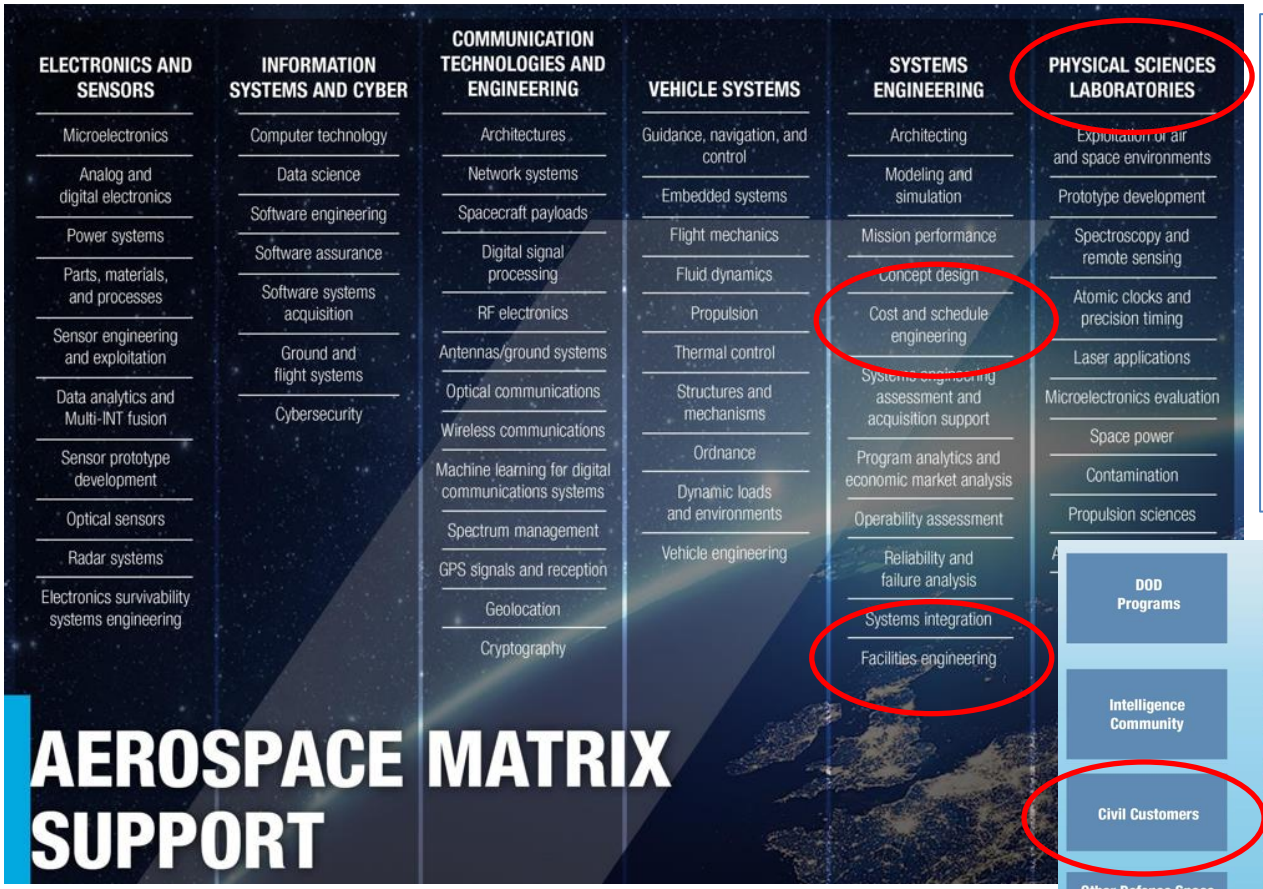
NATIONAL MAGLAB

AEROSPACE



California Nonprofit Corporation

Operates a Federally Funded Research and Development Center (FFRDC)

Provides scientific and engineering services for DoD, IC, and Civil customers

NATIONAL MAGLAB

Scope Development – What is an FCA?

NSF REQUIREMENTS

- Inform NSF and the MagLab of anticipated major and infrequent maintenance expenses that cause a significant departure from the routine funding profile.
- Allow NSF to proactively address these issues before they become immediate needs.
- Contribute to the protection of the health and safety of employees and of members of the public from hazards and to minimize danger to life and property.

FACILITY REQUIREMENTS

- Funding process for replacement of critical equipment beyond routine grant funding.
- FCA consultant should have expertise beyond typical building systems.
- Focus on risk to the mission rather than just equipment.

AEROSPACE

Assessment Approach

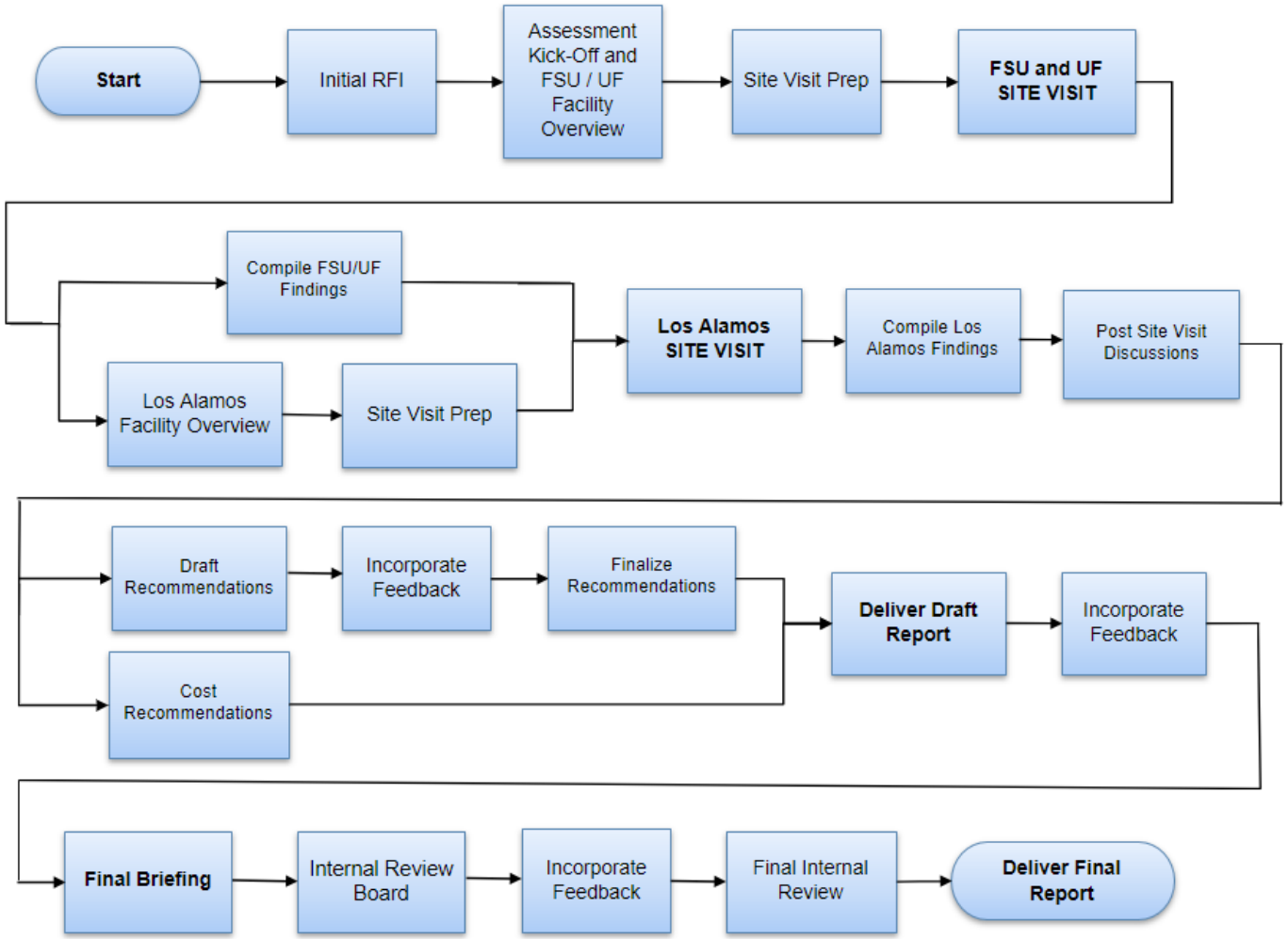
- The assessment of each facility includes a review of operations, maintenance, staffing, processes and procedures, and organizational effectiveness with respect to safety, compliance to codes and standards, reliability, performance, capacity, and utilization.

Procurement

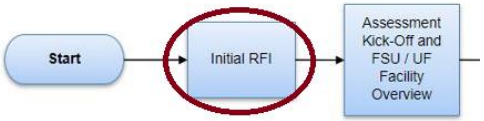
- There were FCA vendors that were solicited that could develop a database of building equipment with lifespan and replacement costs but were unable to assess scientific or industrial electrical equipment.

- The Aerospace Corporation was selected:
  - Aerospace has expertise in assessing specialty equipment and were able to review the facility in various areas regarding risk to our mission.
  - They operate a federally funded research and development center (FFRDC) and are not able to respond to competitive solicitations.
  - The PO was submitted as a sole source exemption.
    - This was approved by the NSF, but not by FSU contracts and grants.
    - We ended up paying for the purchase using non-federal funds.

Assessment – Process Flow Chart



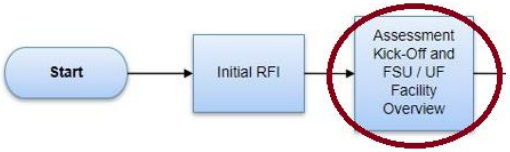
Initial Request for Information (RFI)



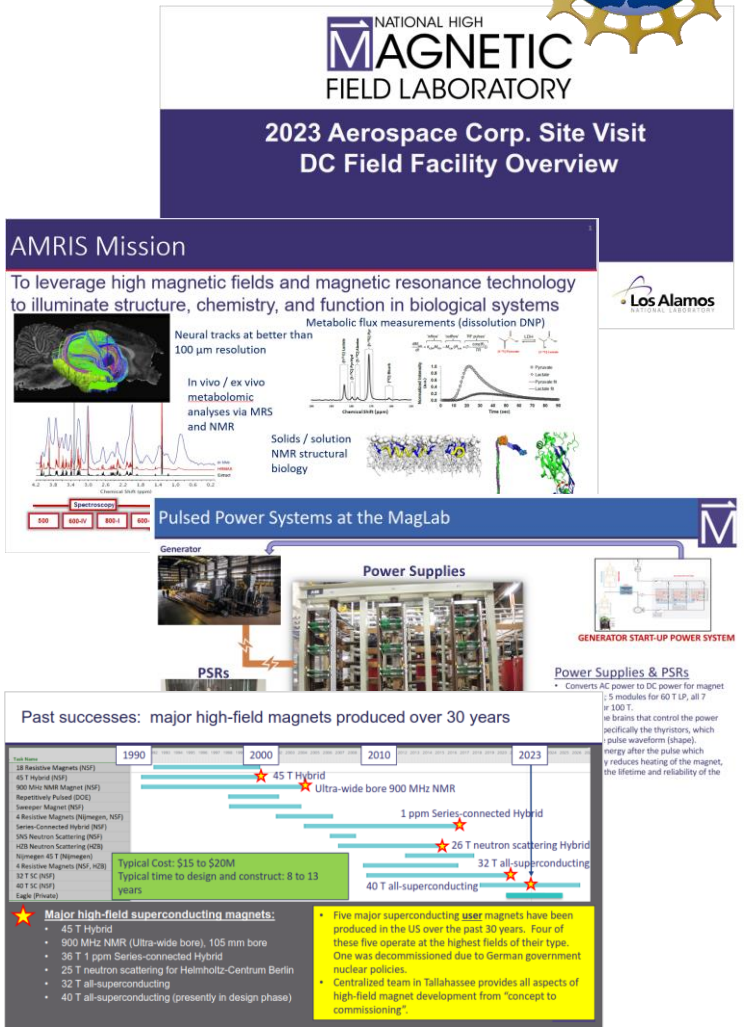
- The purpose of the initial RFI was to collect high-level documents early in the assessment.
- The focus of the RFI was to retrieve documents that were easily accessible.
- The initial RFI helped the assessment team become familiar with the facility organization, the design requirements, how the facility operates, staffing requirements, maintenance strategies, past and proposed projects, and long-range plans.

	Data Request
	General
1	Organizational Charts *Include positions for relevant departments*
2	Department Roles and Responsibilities
3	Site Plans/Layouts
4	Description of Facility Operations *Examples: CONOPs, Program/Project Manual, etc.*
5	Facility/Equipment Overviews *Description and capabilities of major systems and critical equipment.*
6	Internal/External Assessments (past 5 years) *Facility Assessments, Self-Assessments, Audits, etc.*
	Design Documents
7	System Schematics *Piping & Instrumentation Diagrams (P&ID), Functional Operating System Diagrams (FOS), Control Logic, Electrical Single Line Diagrams, etc.*
8	System Requirements *Overview of facility/system design requirements and specifications. Overview of any specialized and/or critical equipment.*
9*	FMEAs, Fault Trees, and/or Risk Evaluations
10*	Design Evaluations *Any open design concern evaluations: Low margin, equipment workarounds, severe unresolved degradation, etc.*
	Operations
11	Major Facility/Equipment Outages (past 5 years) *Planned and Unplanned: Include description, duration, cause.*
12	Failure/Incident Reports *Root Cause Analysis, Equipment Cause Analysis, etc.*
13*	Climate Resiliency/Severe Weather Mitigation Plans *Strategic plans, procedures, and/or upgrades implemented or planned to mitigate the effects of severe weather and/or climate change.*
14*	System/Equipment Health Reports *Includes any open operability evaluations, operator work arounds, and equipment in alarm.*
15*	Upcoming Unique or Large Tests/Evolutions
16*	Safety Concerns *Any open personnel, equipment, or environmental safety concerns. Electrical ArcFlash/Analysis. Provide incident reports and evaluations.*
	Maintenance
17	List of Planned Maintenance Performed (past 5 years) *Include Preventative, Corrective, and Emergent*
18	List of Unplanned Maintenance Performed (past 5 years) *Include Preventative, Corrective, and Emergent*
19	Maintenance Backlog/Deferred Maintenance
20*	Obsolesce Plans *List of unique/obsolete components with long-lead replacement times.*
21*	Maintenance Plans of Program Document *Provide lists of PMs, description of PM task, etc.*
	Capital Improvements
22	Major Projects Planned or Completed (past 5 years)

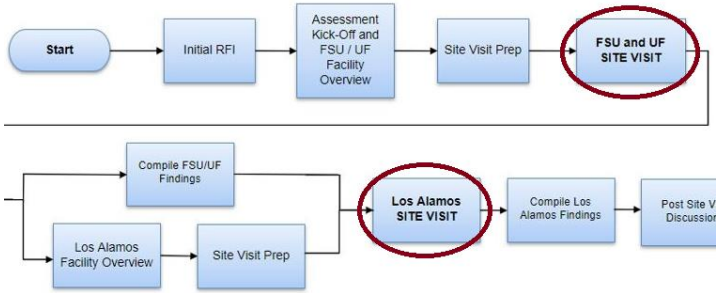
Facility Overview Briefings



- Each facility leader provided an overview briefing prior to the site visits (~ 30 min. per briefing)
- Facility Overview Agenda:
  - Overview of facility mission, major systems, and critical/high value assets
  - Overview of organization, staff, and functions
  - Recent successes
  - Recent failures/issues
  - Major projects/upgrades implemented and planned
  - Q&A



Site Visits



FSU: Oct 30, 2023 – Nov 1, 2023

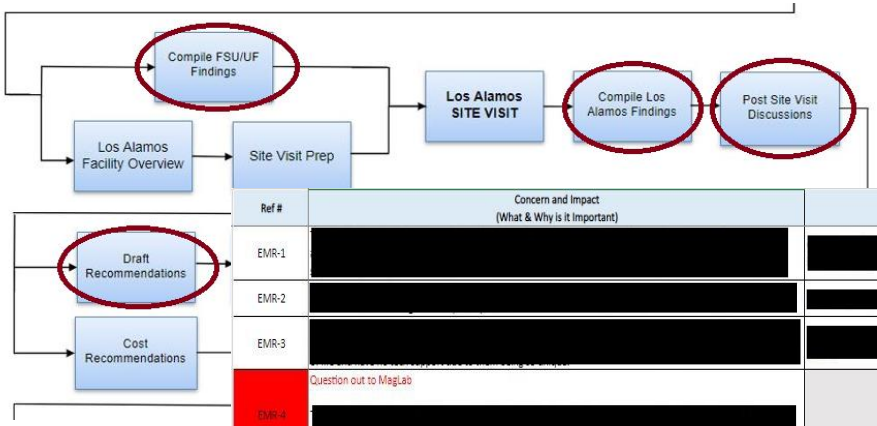
UF: Nov 2, 2023

LANL: Nov 14, 2023

- Kick-off meeting for introductions and to discuss schedule
- Exit meeting to share any major findings (safety issues), general thoughts, and next steps
- Time at the beginning and end of the day for assessment team tag-up independent of MagLab
- Time to talk with facility staff including management, operations, maintenance, and engineering staff
- Guided tours to orient the assessment team and point out areas of concern with time allocated to walk the facility independently (or with an escort)
- It was also requested to have subject matter expert available to answer questions about the equipment

Start (ET)	Duration (minutes)	2. Day, October 31, 2023 (Tuesday)
		Breakfast (on your own)
9:00 AM	30	**Short kick-off meeting - room: B101**
		Introduction everyone in person
		Discussion about schedule
9:30 AM		**Drop off items at B210 - Walkdowns - Nuclear Magnetic Resonance (NMR) Facility**
		Overlook look down at the 900 MRI and 850/830 space
		NM112 and NM111 (900/control room)
		NM118 (future 850)
		NM104: 800#1 and 800#2
		NM116 (part 1): 600 DNP, 600 ODNP
		NM116 (part 2): 800SOL replacement
		NMR Building Inspection
12:00 PM	60	**Self Organized Lunch**
1:00 PM		**Walkdowns - Ion Cyclotron Resonance (ICR) Facility**
		NM117 9.4T passive/ active
		NM117 14.5T/ Eclipse
		NM-117 - Eclipse
		NM137 - 21T Magnet
		NM137 - 21T Support Infrastructure
		Walkdowns - Electron Magnetic Resonance (EMR) Facility
		B114 - 12.5T, 16T magnets
		C101 - HIPER spectrometer, amplitier, 9T magnet
		C101 - PPMS 7T, 15-17T magnets
		C116 - Bruker new X- Q-band spectrometer
		NMR wing - ODNP console, gyrotron, magnet
		General Science Building Inspection
		Organizing meeting (closed door) - room: B210
5:00 PM		**Adjourn**

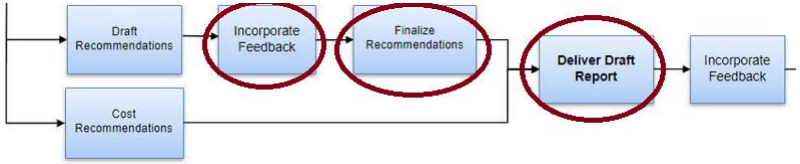
Initial List of Findings and Observations



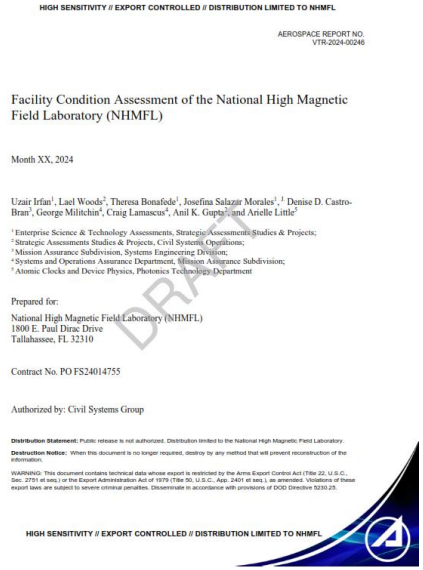
Ref #	Concern and Impact (What & Why is it Important)	Recommendation	Finding/ Observation	Link to Photo	Link to Photo 2	Link to Photo 3
EMR-1	[redacted]	[redacted]	Finding	FSU_EMR_AL_192046743_iOS.jpg		
EMR-2	[redacted]	[redacted]	Finding	FSU_EMR_AL_190320049_iOS.jpg		
EMR-3	[redacted]	[redacted]	Finding	FSU_EMR_AL_183236905_iOS_2.jpg		
EMR-4	Question out to MagLab [redacted]		Observation	Picture - TBD	FSU_EMR_UI_1902515.jpg	FSU_EMR_UI_2017390.jpg
EMR-5	Question out to MagLab [redacted]		Finding	Picture - TBD		
EMR-6	Waiting on MagLab response. [redacted]		Finding	FSU_EMR_UI_0441591_2.jpg		
EMR-7	[redacted]		Observation	FSU_EMR_AL_183236905_iOS.jpg	FSU_EMR_AL_192046743_iOS.jpg	FSU_EMR_DCB_0848.JPG

- The purpose of this review was to present results prior to the draft report being delivered so we can discuss any major concerns to prevent delays in delivering the final report.
- The results were presented as “Findings” (items which present risk to the mission) and “Observations” (items which are “good to do”).
- Each facility leader had the opportunity to review the list and provide comments. In certain cases, follow-up meetings were held for further discussion.

Draft Report



- A 150-page technical report was put together for review and comment by MagLab leadership and internal Aerospace senior reviewers.
- Technical Report included:
  - Executive Summary
  - Purpose and Scope
  - Assessment Process
  - Overview of facility mission and infrastructure
  - Results of the assessment:
    - Overall impressions of the facility, positive practices, major concerns, and areas for improvement
    - Assessment findings and observations
    - Risk rankings and impact areas
    - Facility condition ratings
    - ROM costing of recommendations



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AEROSPACE REPORT NO.
VTR-2024-00246

Facility Condition Assessment of the National High Magnetic Field Laboratory (NHMFL)

Month XX, 2024

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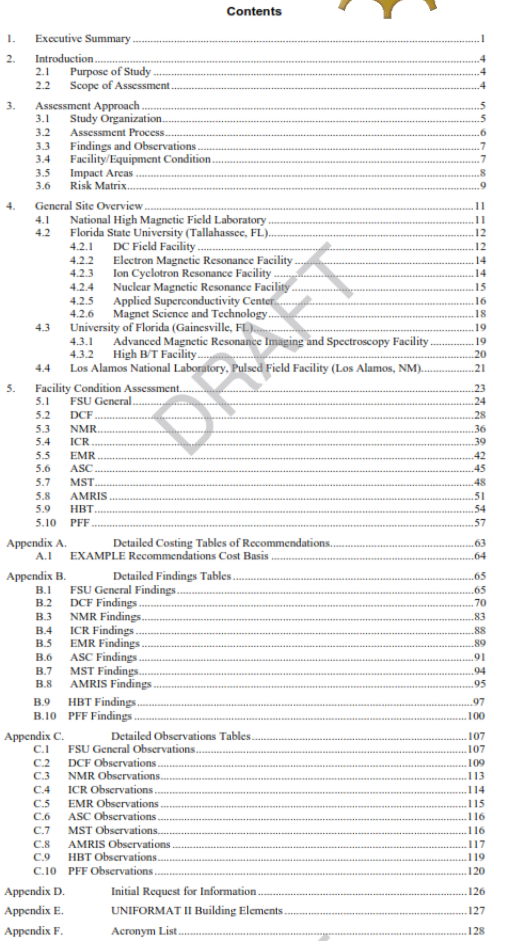


Contents

Draft Report

Tables summarize each facilities finding, recommendation, impact area, risk priority, and ROM cost.

Table 17. Findings Risk and Priority Summary - DCF (Part 4)

Reference Number	Findings	Recommendation	Impact Area		Risk			ROM Cost	
			Primary Impact Area	Secondary Impact Area	Consequence	Likelihood	Risk Priority	Low ($K)	High ($K)
DCF-22	[redacted]		System, Structure, Component	Maintenance	1	1	5	[redacted]	
DCF-23			System, Structure, Component	Reliability	2	2	4		
DCF-24			System, Structure, Component	Maintenance					

Appendix's have tables that present each finding and observation in detail. These include pictures and impact areas.

Reference #: DCF-23

Primary Impact: System, Structure, Component

Secondary Impact: Reliability

ding

[redacted]

endation

Score	Rating	Condition
5	Excellent	Plant in sound physical condition designed to meet current standards. Operable and well-maintained. Asset likely to perform adequately within routine maintenance for 10 years or more. No work required and/or only normal maintenance required
4	Good	Acceptable physical condition but not designed to current standards or showing minor wear. Deterioration has minimal impact on asset performance. Minimal short-term failure risk but potential for deterioration or reduced performance in medium term (5 – 10 years). Only minor work required (if any).
3	Fair	Functionally sound plant and components but showing some wear with minor failures and some diminished efficiency. Minor components or isolated sections of the asset need replacement/repair, but asset still functions safely at adequate level of service. For example, bearing and gland wear becoming evident and some corrosion present. Deterioration beginning to be reflected in performance and higher attendance for maintenance. Failure unlikely within 2 years but further deterioration likely and major replacement required within next 5 years. Work required but asset is still serviceable.
2	Poor	Failure likely in short-term. Likely need to rep health or safety but works required within 2 y short-term, asset barely serviceable.
1	Very Poor	Failed or failure imminent. Immediate need t Health and safety hazards exist which present serviced/operated without risk to personnel. Major work or replacement required urgently

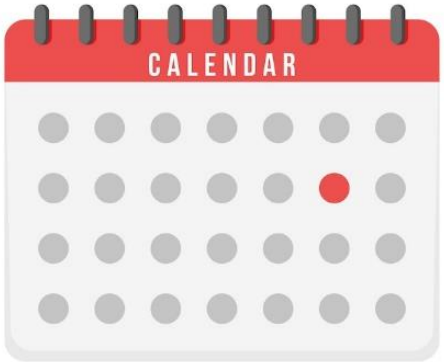
	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5	Total	ROM Low ($K)	ROM Low ($K)
[redacted]	0	0	6	2	1	9	[redacted]	
	3	5	9	3	2	22		
	0	2	1	1	0	4		
	0	0	0	1	0	1		
	1	2	4	1	0	8		
	0	1	0	0	0	1		
	0	2	1	0	0	3		
	0	1	1	1	1	4		
	1	1	1	1	0	4		
	1	1	10	5	1	18		
Total	6	15	33	15	5	74		
ROM Low ($K)	[redacted]					Total ROM Low ($K)		
ROM High ($K)						Total ROM High (SK)	[redacted]	

Each facility was assigned facility condition ratings broken up by "building equipment" and "scientific equipment" sub-element.

Various summary tables were generated to help visualize assessment results and identify trends.

FCA Schedule

- **May 2023** – Meetings with Internal Stakeholders & NSF Program Manager to Develop Scope
- **June & July 2023** – Meet with Vendors & Develop Statement of Work & Funding Plan.
- **August & September 2023** – Procurement; Facility Equipment Lists
- **October 2023** – Information Gathering
  - RFI, Kickoff Facility Overviews (7 different user programs)
- **November 2023** – Site Visits (FSU, UF, LANL)
- **January 2024** – Findings Table, Findings Table Review
- **February 2024** – Draft Report, Draft Report Review
- **March 18, 2024** – Final Report
- **April 30, 2024** – Limited Asset Management Plan
- **Summer 2024**– NSF Site Visit & FCA Review



Facility Condition Assessment – Lessons Learned

- The assessment takes a long time!
  - Start planning early about 1 year out.
- You will need to convince facility managers of the value
  - The more staff time spent engaging in the assessment, the better the results will be.
- The site visits schedules were very tight
  - Have a preliminary scoping visit with the consultant before the site visit.
- Have an open mind when receiving feedback
  - An experienced FCA consultant has seen many different facilities.
- Scope the FCA to integrate into the AMP
  - This will help with the development of an Asset Management Plan (AMP).
- Keep open communication between the facility, NSF program manager and third-party consultant.
  - Collaboration between all parties helps align expectations