

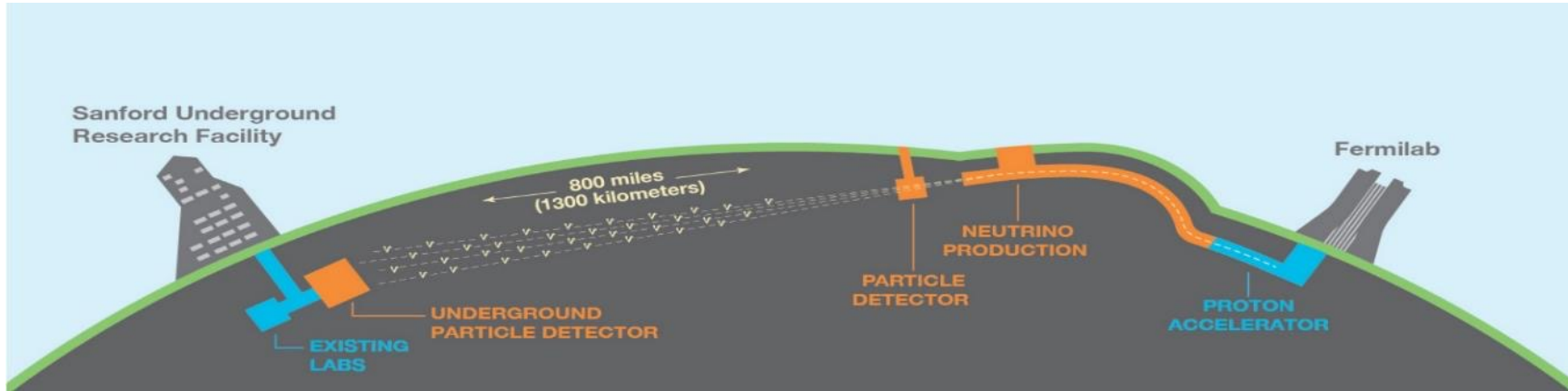
LBNF/DUNE Project Update

Community Update Meeting
12 December 2023

Agenda

- | | |
|--|---|
| • Welcome and Introduction | Zach Burton, <i>Communications and Community Relations Manager</i>
Joe Pygott, <i>Head of South Dakota Services</i> |
| • Excavation Progress | Mike Gemelli, <i>LBNF FSCF Project Manager</i> |
| • Buildings & Site Infrastructure (BSI) Overview | Syd Devries (<i>LBNF-BSI Design Manager</i>)
Scott Lundgren (<i>KAJV</i>) |
| • Far Detector and Cryogenics (FDC) Overview & Hiring Needs | Jolie Macier, <i>FDC Project Manger</i>
Luke Mickelson, <i>LBNF/DUNE-US Human Resources</i>
Mike Pfaff, <i>FDC Installation</i> |
| • SDSTA Update | Mike Headley, <i>SDSTA Executive Director & Laboratory Director</i>
Will McElroy, <i>SDSTA Operations Division Director</i> |
| • Comments/Questions | |

World-Class Facility supporting World-Class Experiment

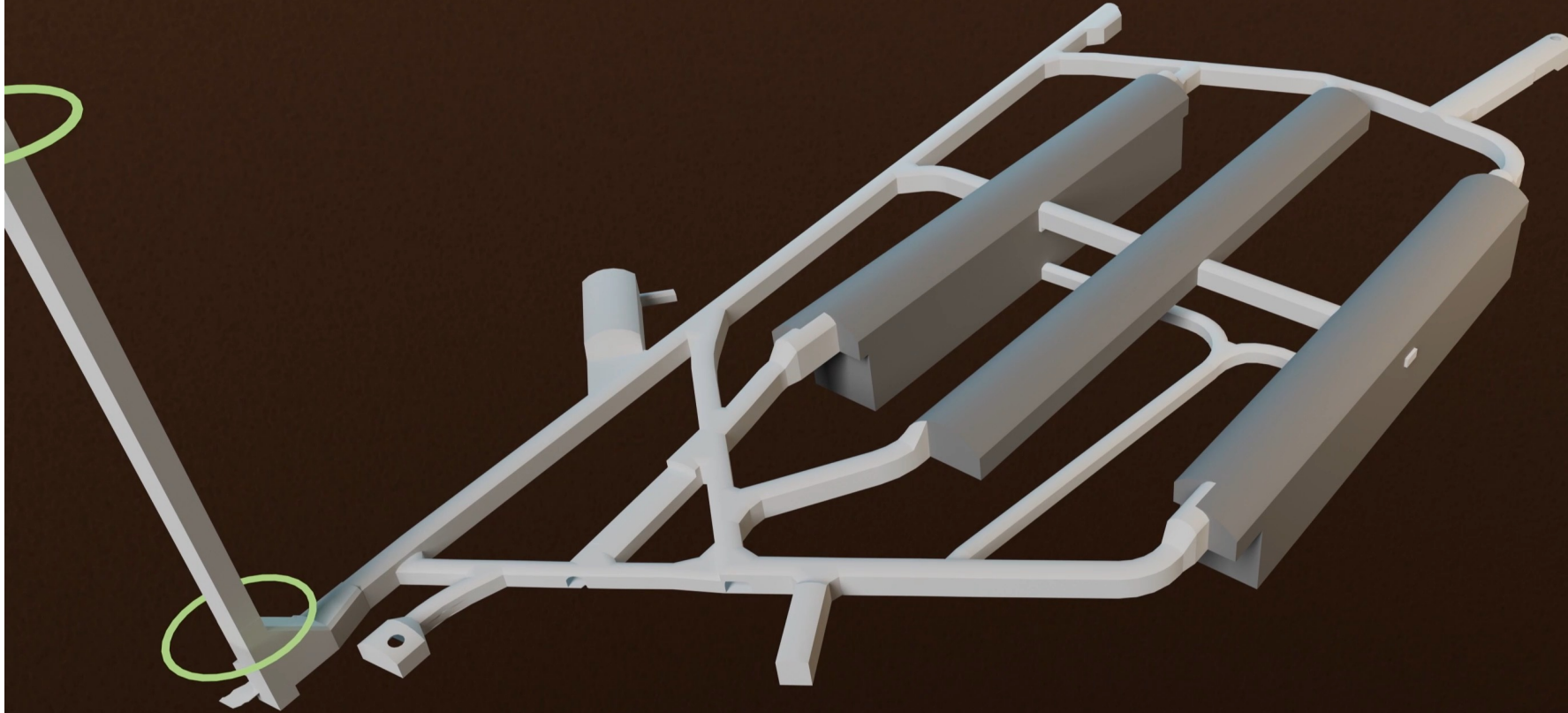


- The Deep Underground Neutrino Experiment will be a **game-changing experiment** for neutrino science, potentially transforming our understanding of why the universe exists as it does.
- The Long-Baseline Neutrino Facility is the **infrastructure** necessary to send a powerful beam of neutrinos 800 miles through the earth, and measure them deep underground at South Dakota's Sanford Underground Research Facility.
- The DUNE/LBNF project will be the **first internationally conceived, constructed, and operated mega-science project** hosted by the Department of Energy in the United States.

LBNF will drive neutrino science forward the way CERN's Large Hadron Collider drove Nobel Prize-winning Higgs discovery

LONG-BASELINE NEUTRINO FACILITY

Far site underground location

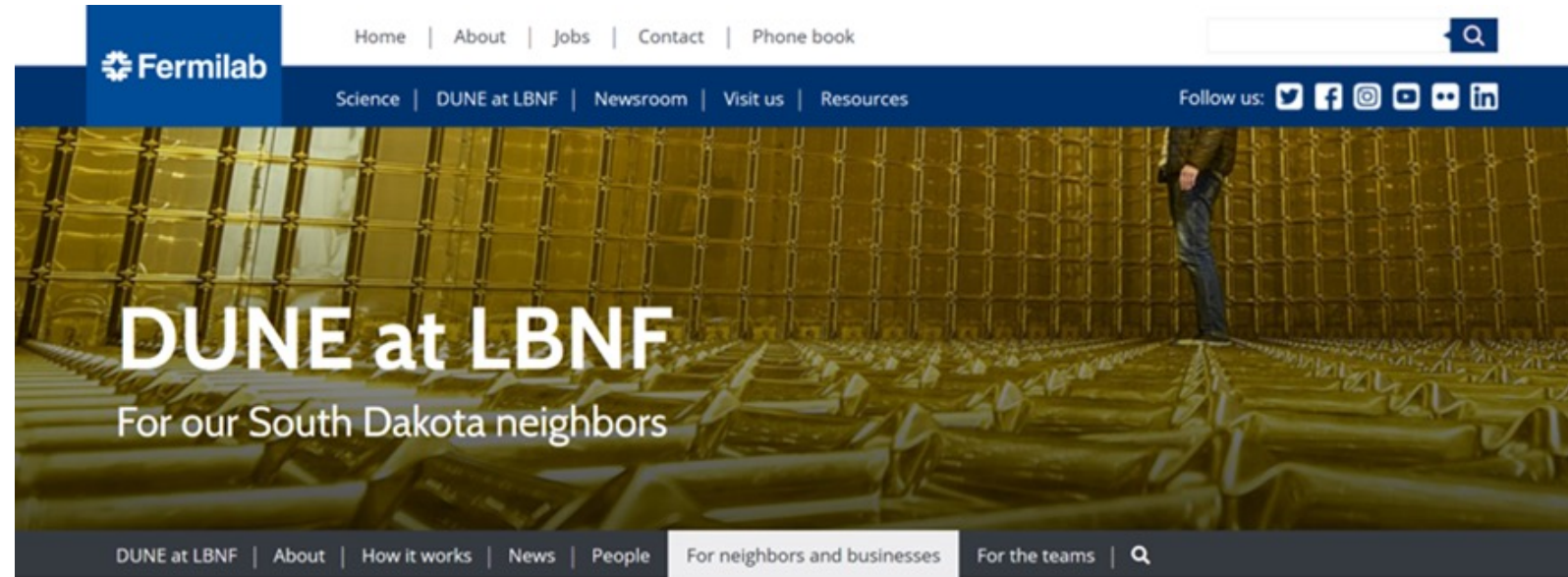


Housing and Office Considerations

- **The LBNF/DUNE Project will attract several groups of people:**
 - Fermilab Employees
 - Partnering Institution Employees/Scientists
 - Sub-contractors
- **Housing**
 - Working to provide housing and housing options
 - Short-term (hotels) – 1 to 2 weeks
 - Medium-term (intermediate) – up to 1-year increments
 - Long-term (permanent) – permanently move to South Dakota
 - Fermilab will be issuing a Request for Information (RFI) to gauge interest in providing potential housing solutions
- **Office Space**
 - The Project will need additional local office space to support Project & Partnering Institution personnel

Additional Resources

- www.fnal.gov/neighbors-sd
- <https://www.fnal.gov/>
- <https://fermilab.jobs/>



We think it is important to keep our neighbors informed about the construction of the Long-Baseline Neutrino Facility and the Deep Underground Neutrino Experiment. To ensure that you have the most up-to-date information, we have set up this website with information about LBNF and DUNE.

- [Answers to frequently asked questions regarding LBNF/DUNE](#)

Community updates

We understand the community's concerns about dust within Lead, emanating from the Open Cut. We apologize for the significant inconvenience and understand the community's frustration. We are committed to working to resolve this issue as quickly as possible.

- [Answers to commonly asked questions regarding the community's concerns with dust](#)

Please do not hesitate to contact us with additional questions at neighbors-sd@fnal.gov.

Excavation Progress

Mike Gemelli

Who Am I

- Recently joined the LBNF FSCF Team in October 2020 as the Project Manager and based in Lead, South Dakota
- Prior experience includes thirty-two years of both domestic and international project management, engineering, construction and maintenance expertise in the following heavy construction industries:
 - Oil & Gas (Upstream & Downstream)
 - Petrochemical
 - Power (Nuclear and Fossil Fuel)
 - Metals & Mining
 - Agriculture
 - Highway, Rail and Bridges
- B.S. Aerospace Engineering and Graduate Certificate in Construction Management

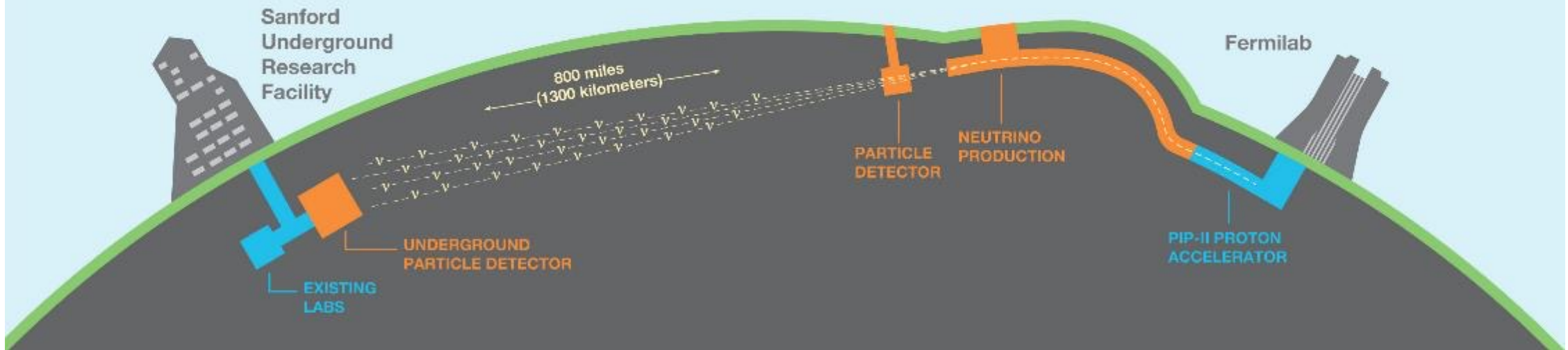
The “Big Picture”

Far Site – SURF in Lead, SD

Facility/Infrastructure and Far Detectors

Near Site – FNAL in Batavia, IL

Facility/Infrastructure, Neutrino Beamline, and Near Detectors



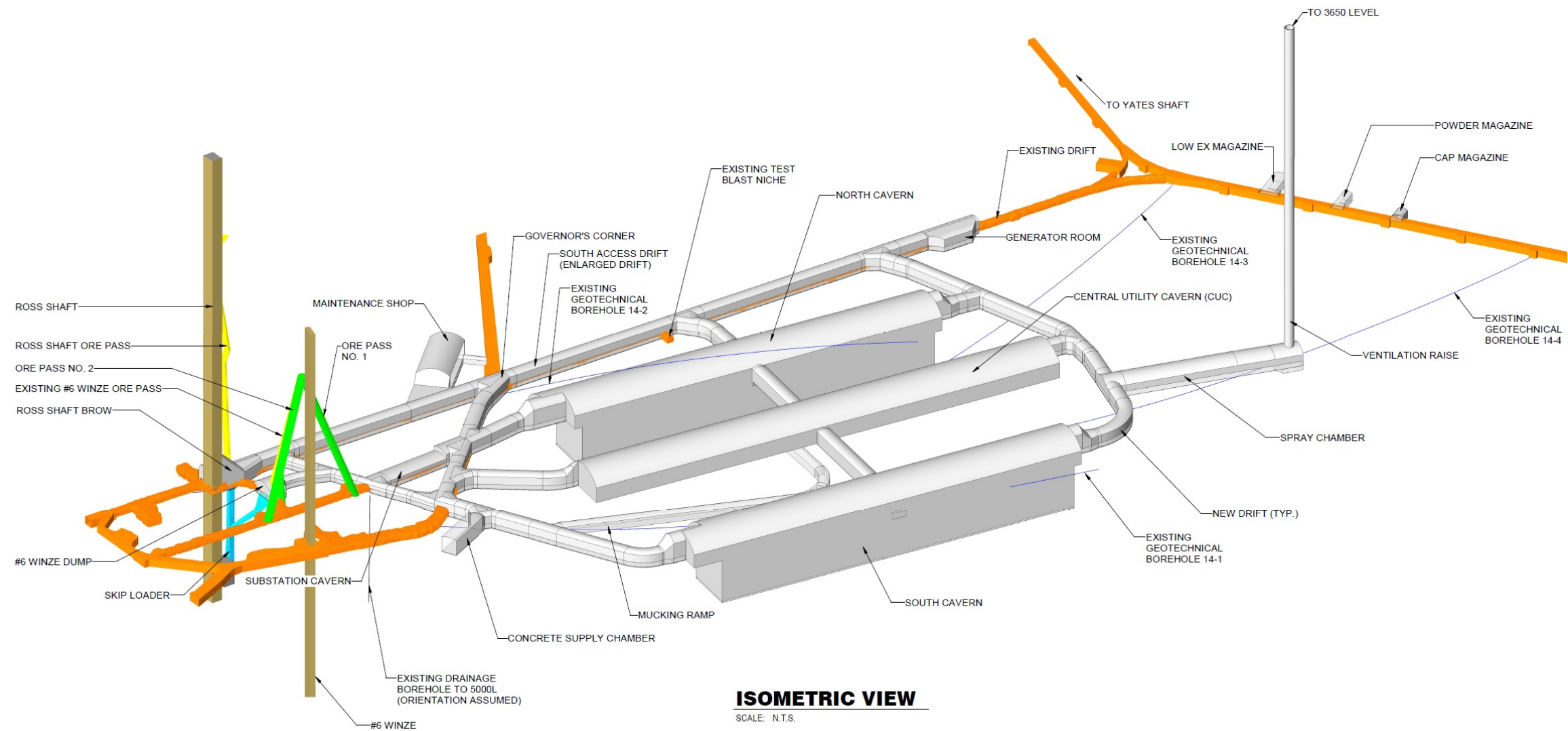
Three Subprojects

- **FSCF EXC** – Far Site Excavation
- **FSCF BSI** – Far Site Building & Site Infrastructure
- **FDC** – Far Detectors and Cryogenic Infrastructure

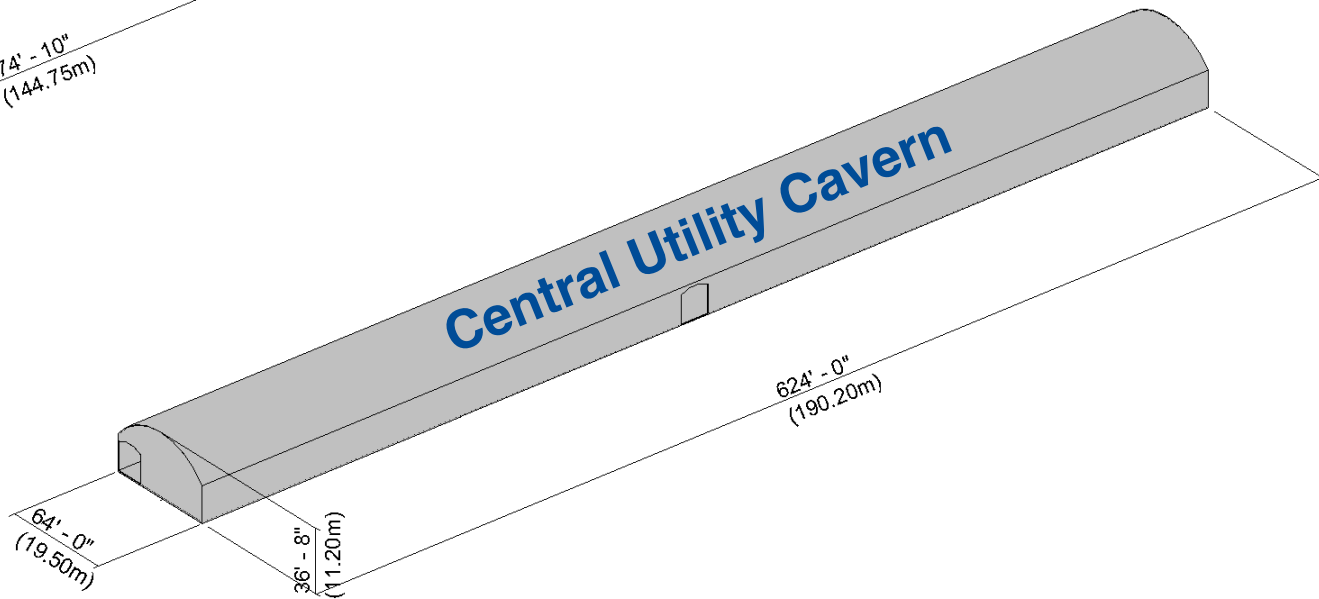
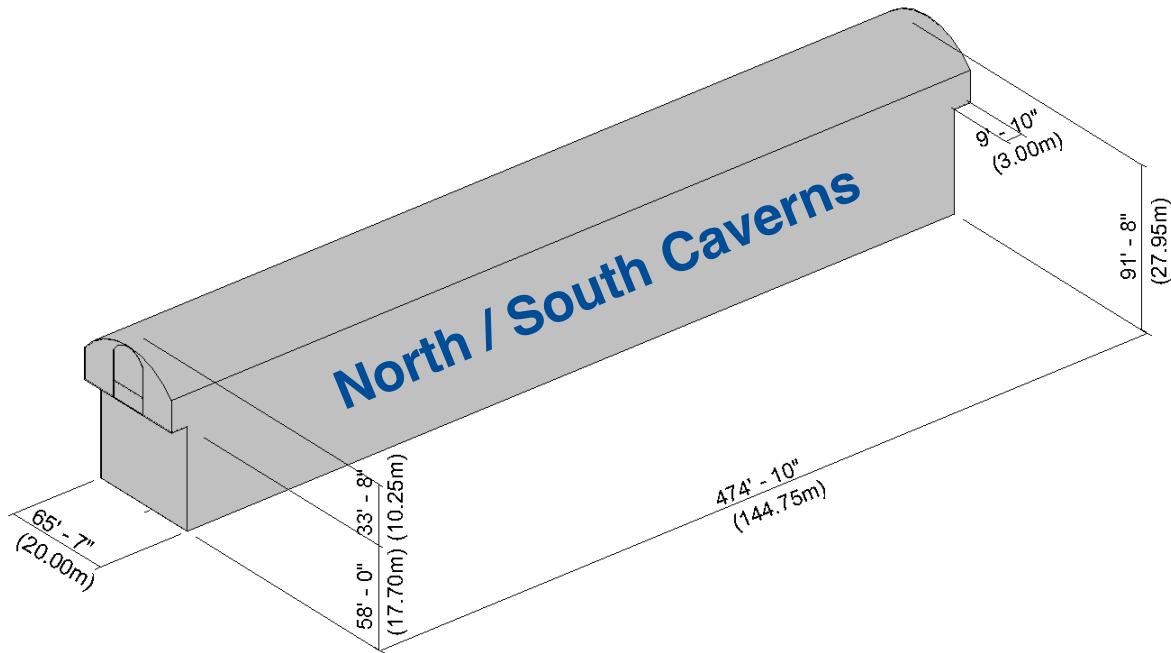
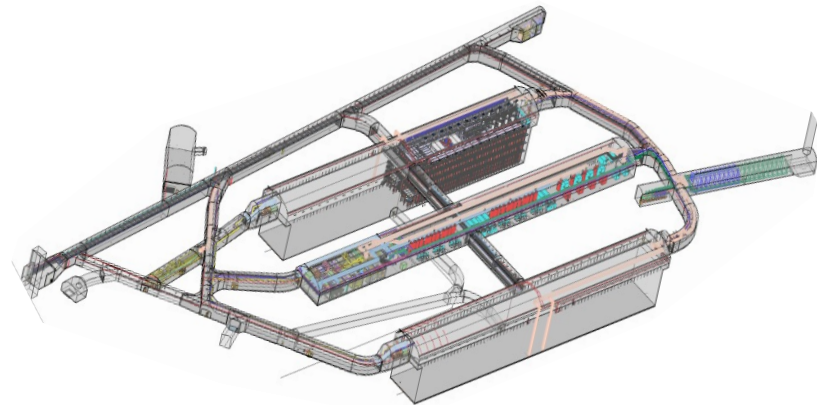
Two Subprojects

- **NSCF+B** – Near Site Conventional Facilities + Beamline
- **ND** – Near Detectors

Excavation Overview



Size of Excavations

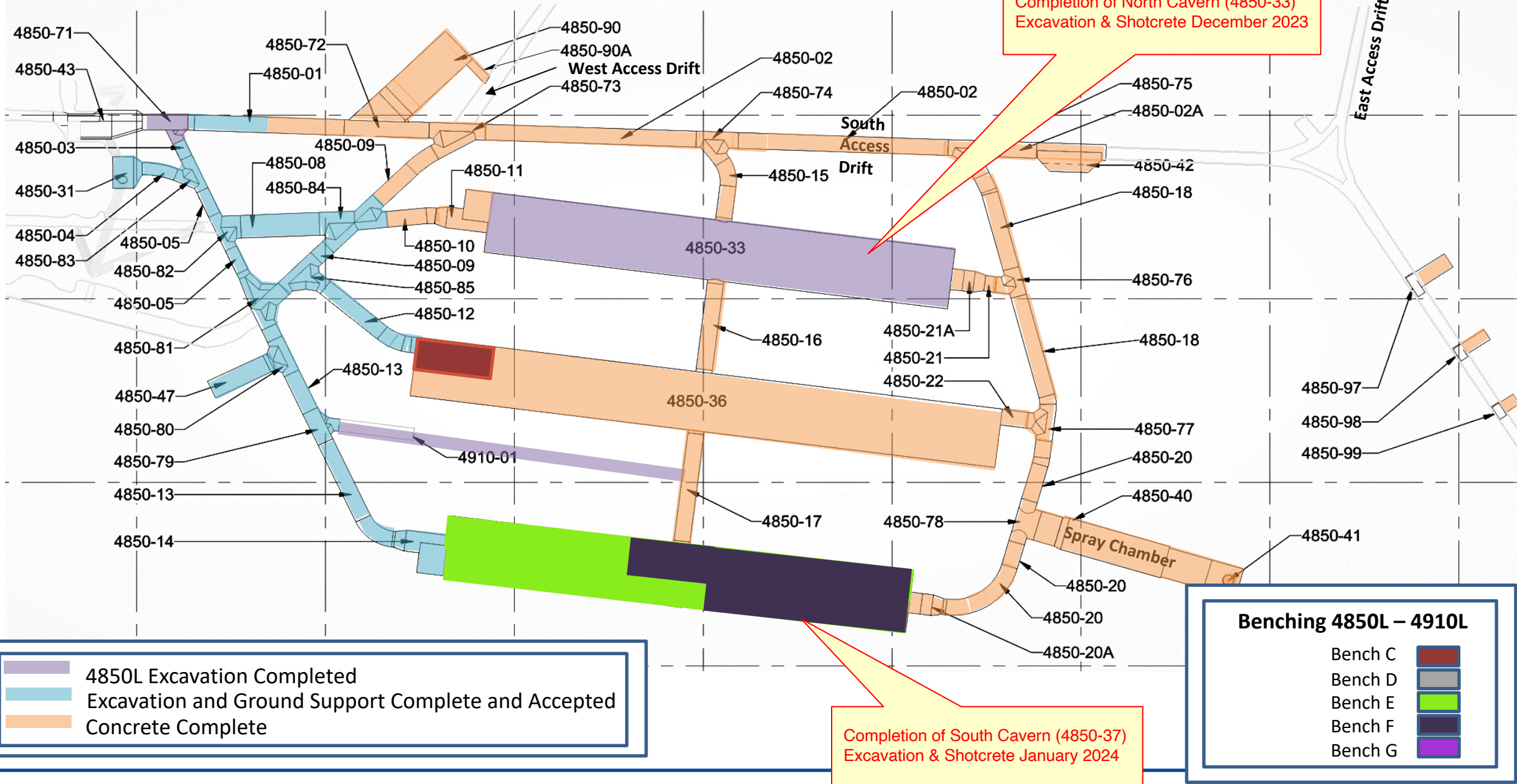


Excavation Scope of Work

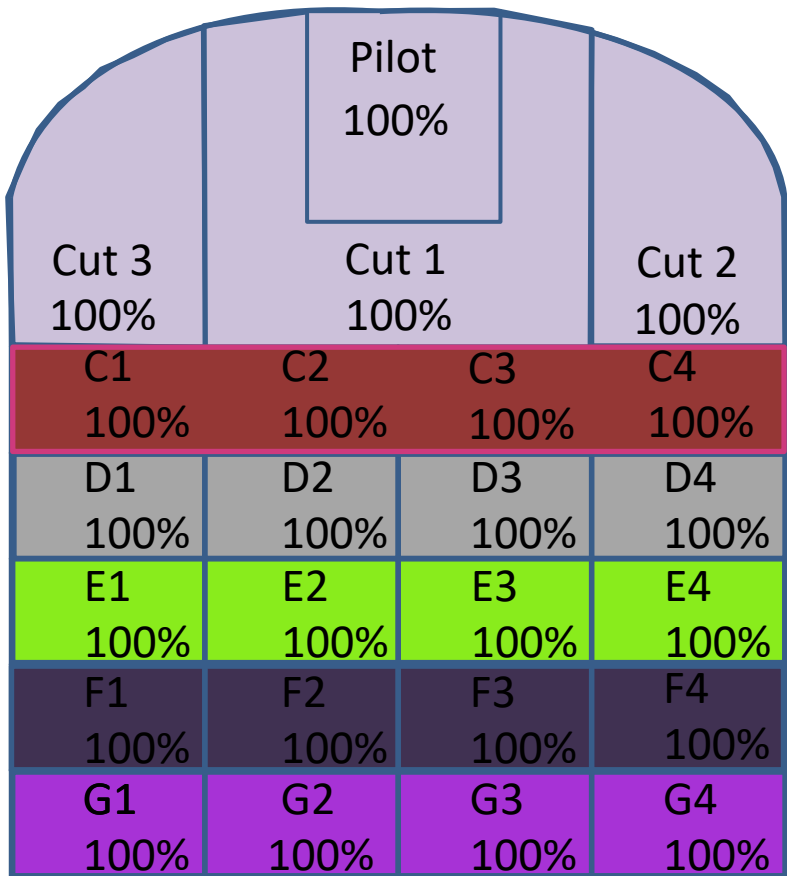
Excavation includes:

- Development of all spaces underground, primarily through drill and blast techniques.
- Raise bore development connecting the 4850L to the 3650L
- Installation of ground support with a combination of rock bolts, mesh, and shotcrete (fiber and non-fiber reinforced used)
- Installation of finished concrete floors
- Provision in each detector cavern for:
 - Anchorages for bridges
 - Supports for mezzanines
 - Monorails for overhead cranes
- Installation of long-term rock monitoring systems

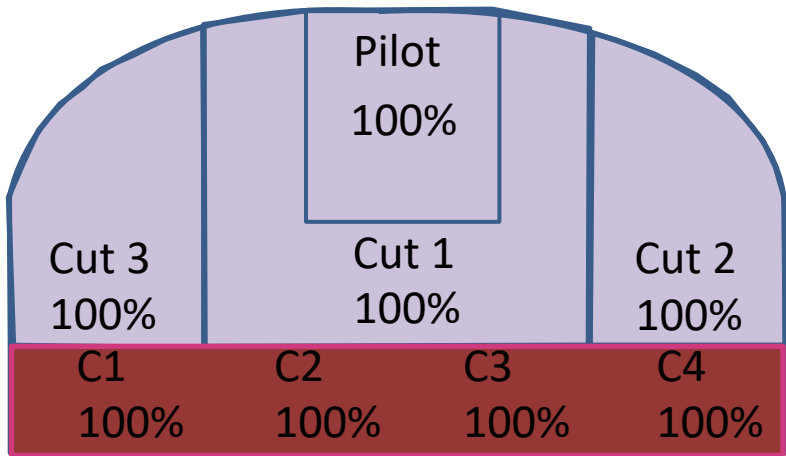
Total Excavation Completed to Date (Forecasted) ~ 93%



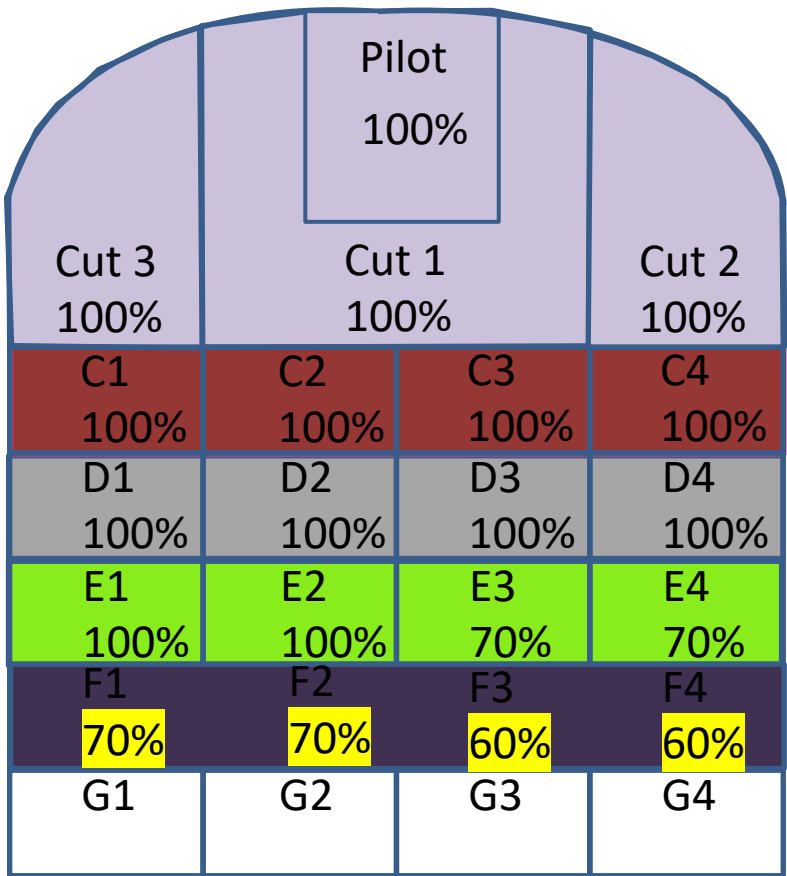
Cavern Excavation Forecasted Completion Percentage



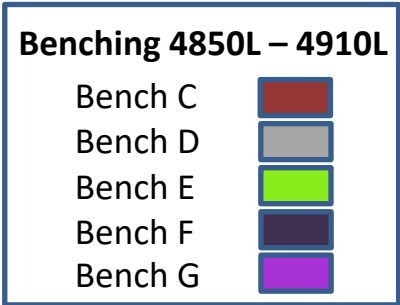
North Cavern



CUC Cavern

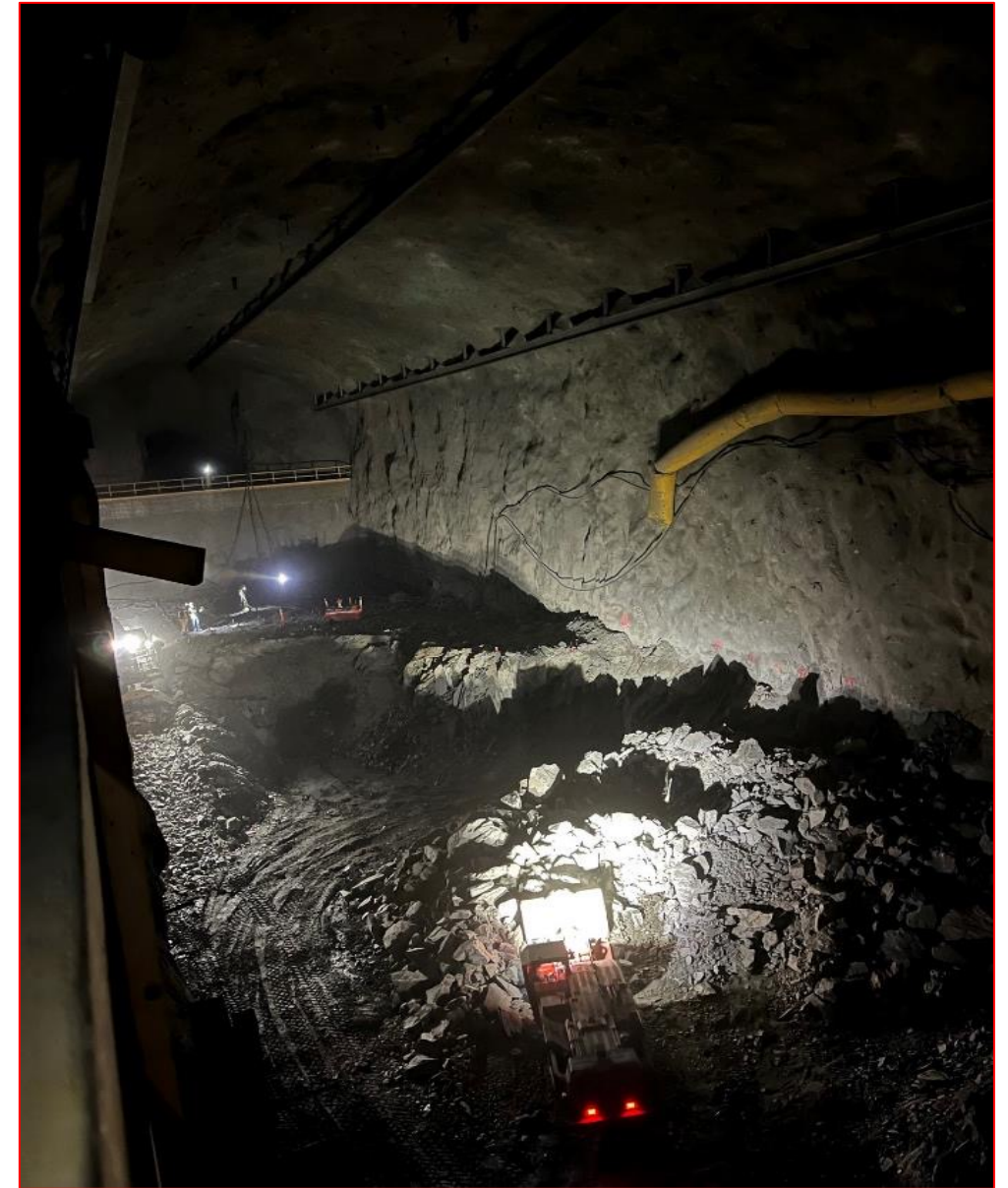


South Cavern



Excavation Quantities

- Excavated 277,000 CYD or 733,000 Tons
- Explosives Consumed: 560 Tons or (1,100,000 Lbs.)
- 75,400 Split Set Bolts Installed (Equivalent of 86 Miles)
- 11,000 Threadbar Bolts (Equivalent of 21 Miles)
- 12,314 CT Bolts Installed (Equivalent of 47 Miles)
- 14,219 Welded Wire Mesh Installed (Over 20 Acres)
- 11,000 CYD Shotcrete Applied
- 4,414 CYD Concrete Poured



South Cavern (4850-37) – Looking East

Open Cut Dust – Dust Control, Monitoring and Communications Plan

- Daily conveyor operations meeting
- Operational restrictions placed on the conveyance of rock during windy/gusty conditions (winds speeds less than 15 mph hourly average)
- Continual direct visual observation of the conditions during conveyor operations and shut down, if dust/opacity is observed crossing the fence into the park.
- Real time ambient/source PM10 concentrations analyzed by FRA daily during conveyance to the Open Cut.
- The project remains under EPA's NAAQS for PM10
- Continued placement of rock treated with the tackifier to reduce the levels of dust and fine particulates.

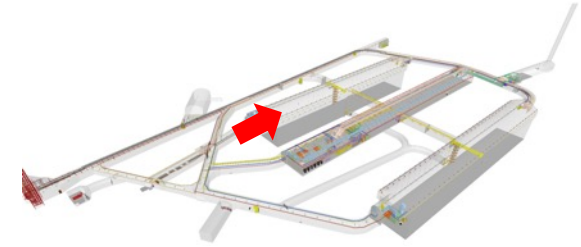


Dust Mitigations Measures and Path Forward

- The discharging to the Open Cut is scheduled to cease operations tentatively in March 2024 after the underground excavation is complete.
- Fermilab will continue to perform air monitoring for PM2.5 and PM10 particulates at its six sampling locations and will continue to record the data. This information will be forwarded weekly to the City of Lead for their records.
- Working with stakeholders to finalize dust mitigation plans as well as disposition of the conveyor system.



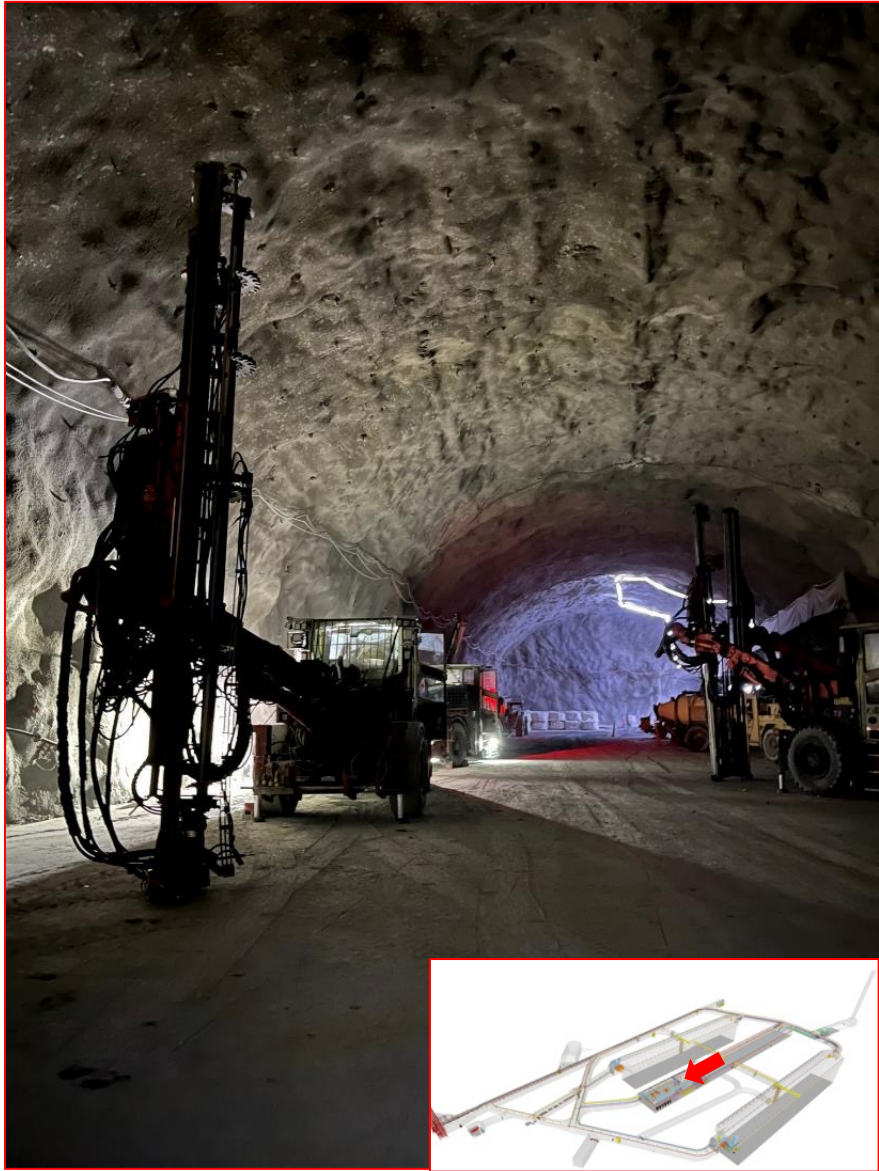
FSCF-EXC Excavation Progress – North Cavern



FSCF-EXC Excavation Progress – North Cavern



FSCF-EXC Excavation Progress – Central Utility Cavern



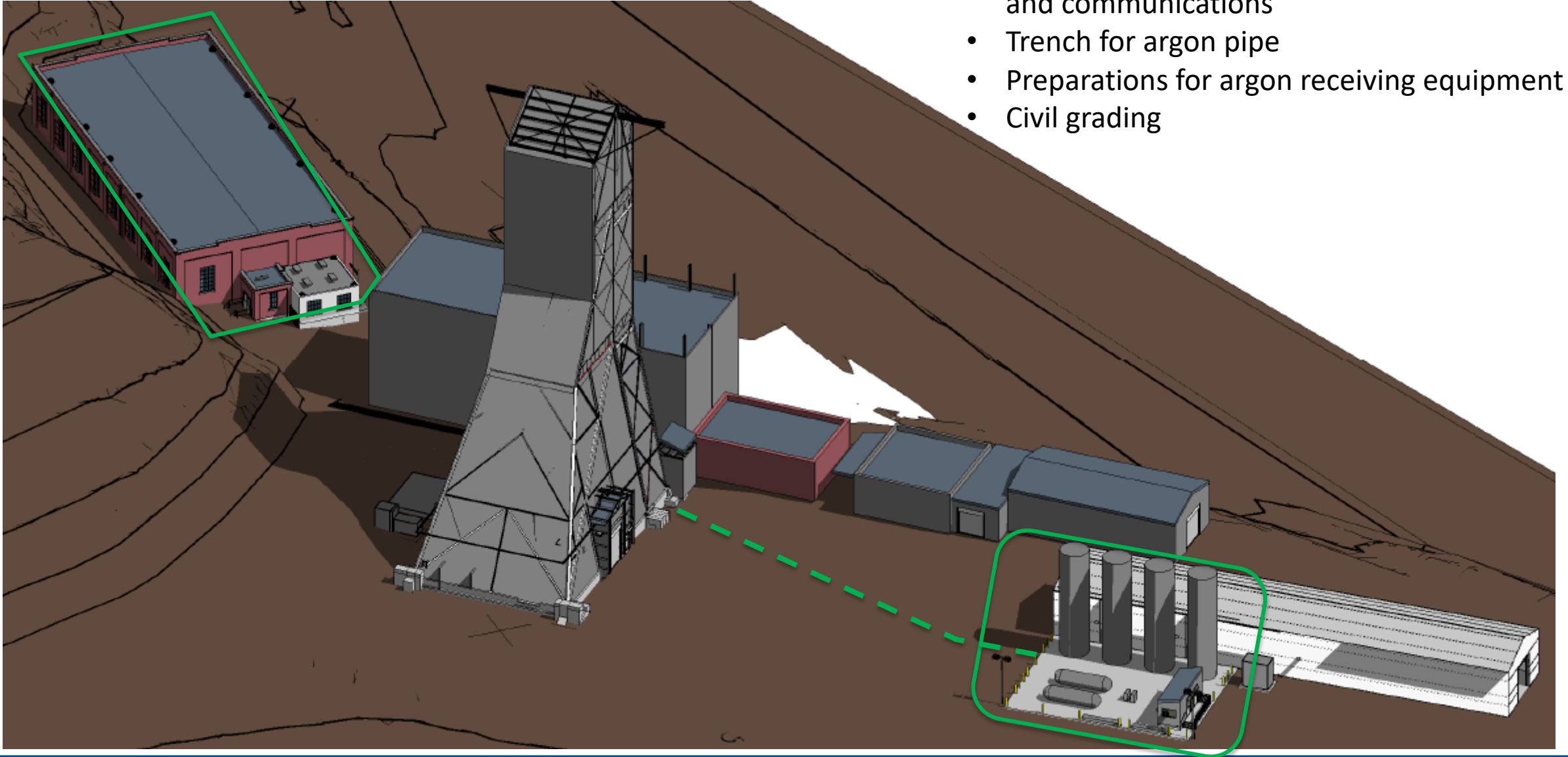
FSCF-EXC Excavation Progress – South Cavern



Buildings & Site Infrastructure

Syd Devries (LBNF-BSI Design Manager)
Scott Lundgren (KAJV)

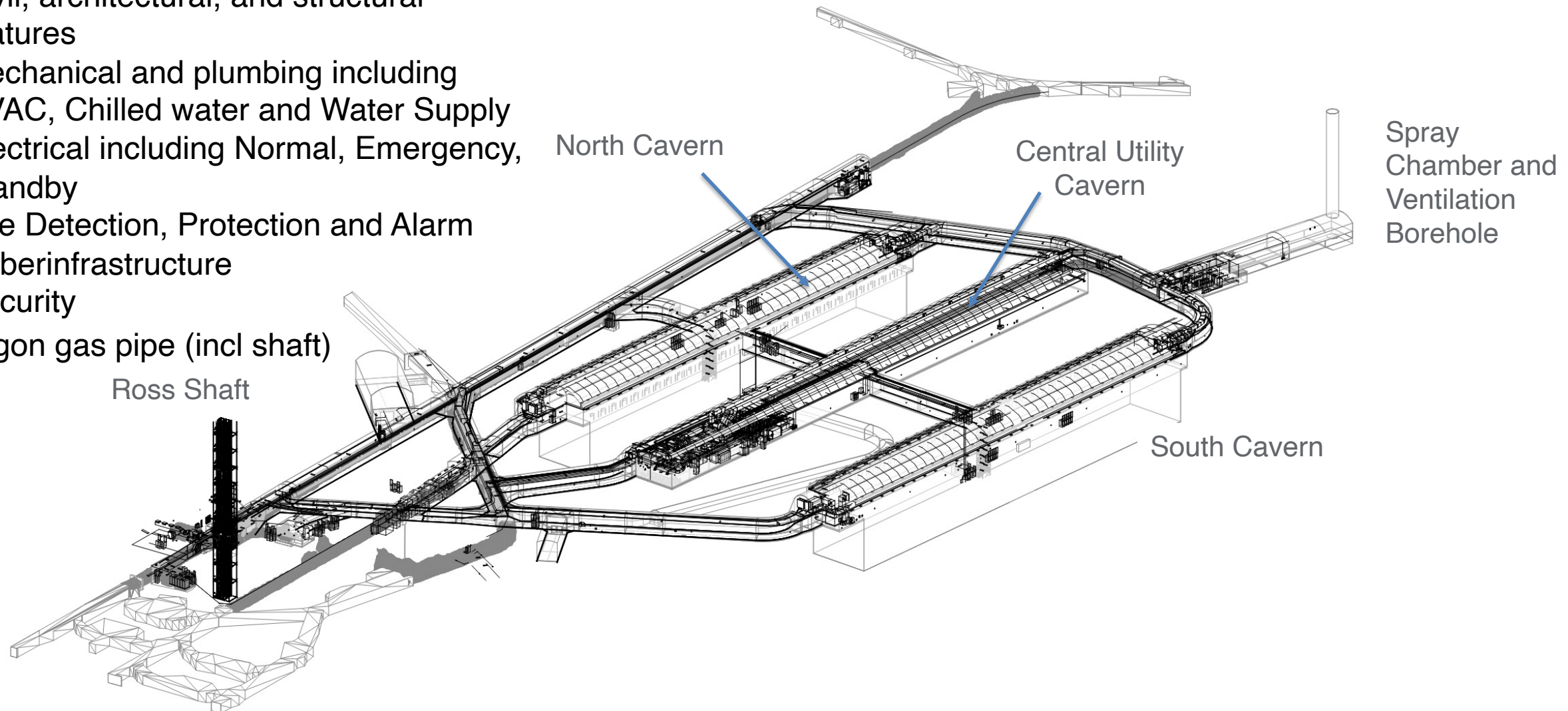
BSI Big Picture - Surface



- Some remodeling in the Ross dry for offices and communications
- Trench for argon pipe
- Preparations for argon receiving equipment
- Civil grading

BSI Big Picture - Underground

- Civil, architectural, and structural features
- Mechanical and plumbing including HVAC, Chilled water and Water Supply
- Electrical including Normal, Emergency, Standby
- Fire Detection, Protection and Alarm
- Cyberinfrastructure
- Security
- Argon gas pipe (incl shaft)



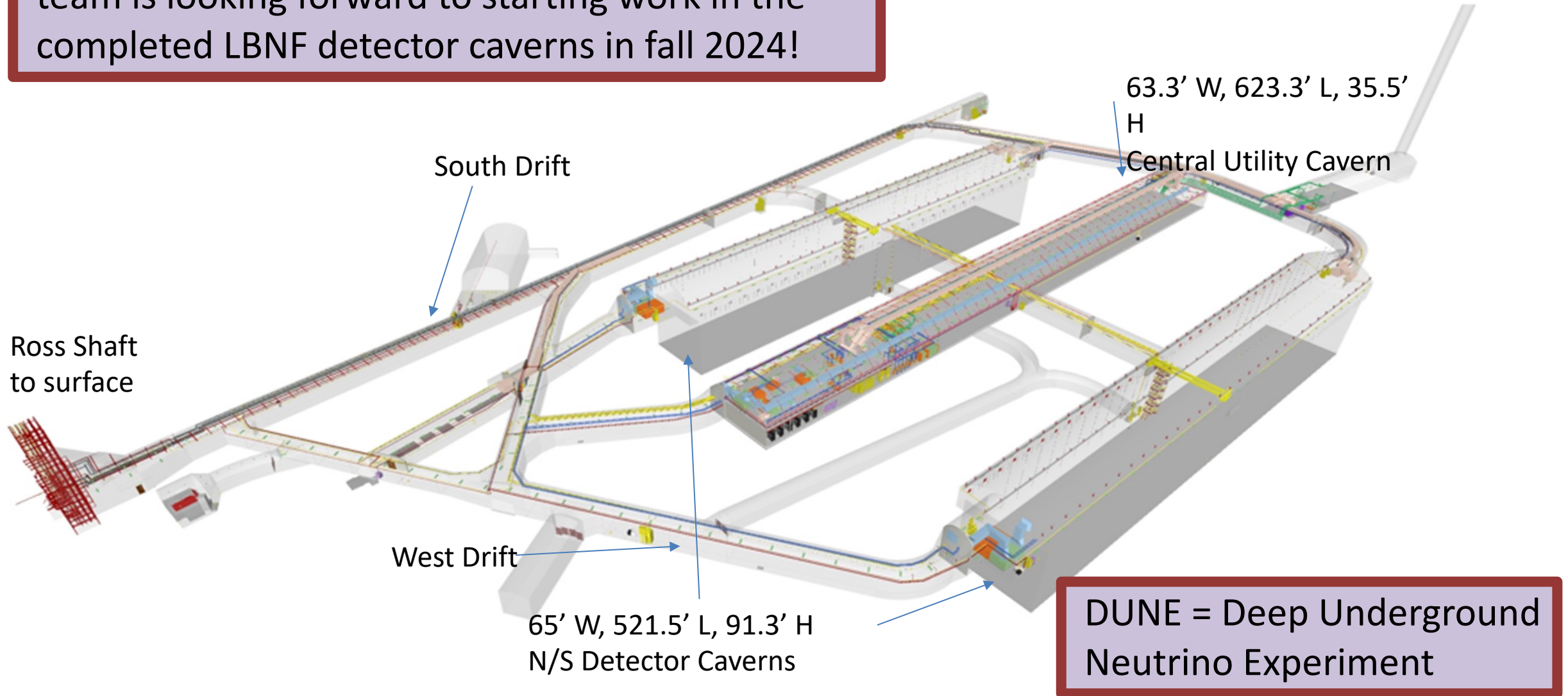
FSCF-BSI Bidding Status

- 15 work packages planned, have proposals for 8, but those 8 represent ~90% of the scope
- Mostly regional contractor pool
- Anticipate similar number of staff as currently (~150 divided between day and night shift)
- Work planned to begin on surface after spring thaw, underground in summer/fall
- Generally working 5 days/week, 2 shifts/day
- Should finish in 2026, shifting all effort to detectors and cryogenics

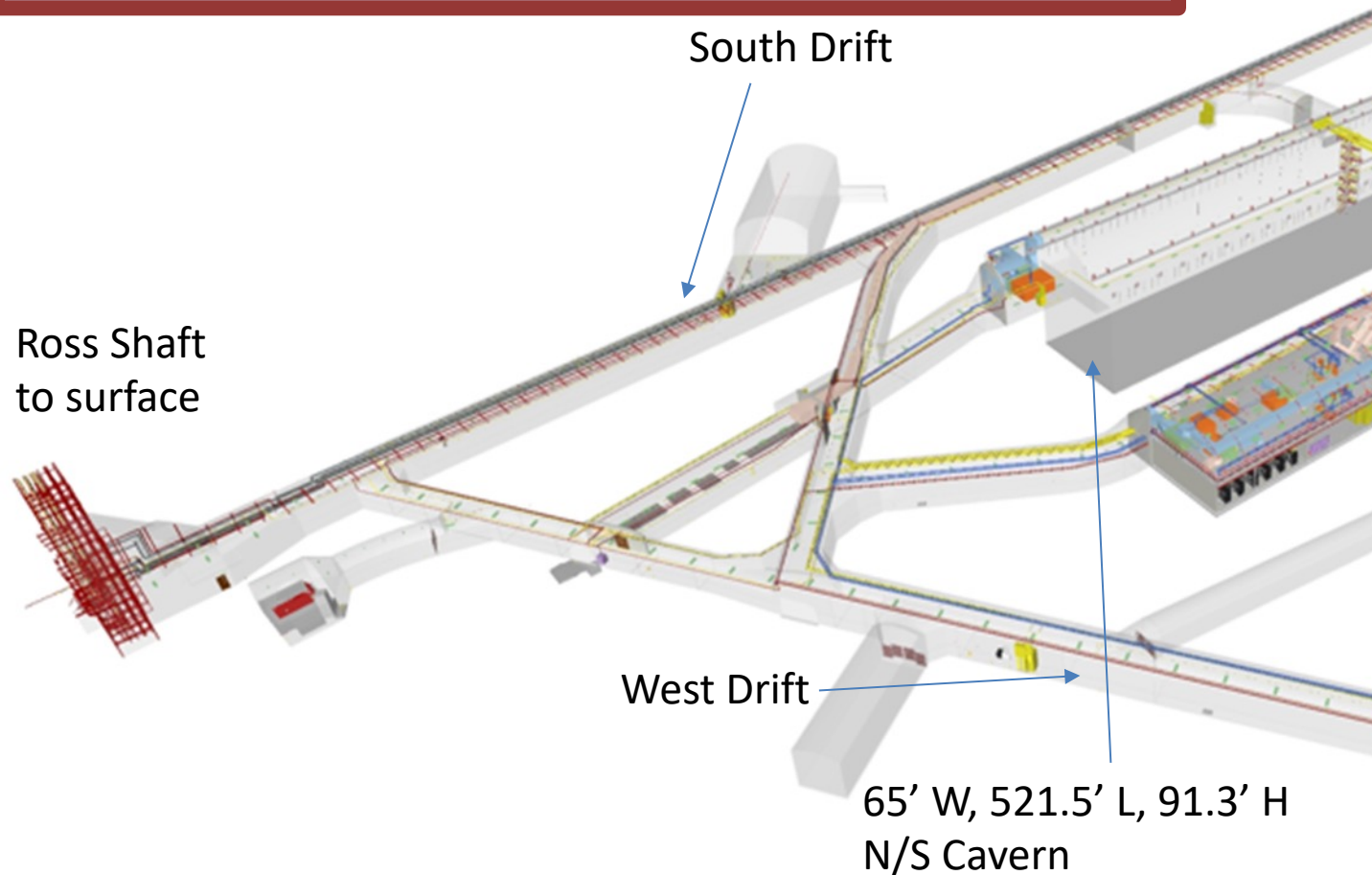
Far Detector and Cryogenics Overview & Hiring Needs

Jolie Macier / Luke Mickelson / Mike Pfaff

The LBNF/DUNE Far Detector & Cryogenics (FDC) team is looking forward to starting work in the completed LBNF detector caverns in fall 2024!



Thanks to the Conventional Facilities team,
KAJV and TMI for all of the work to deliver
beautiful underground caverns!



FDC Scope Overview

- Construct **cryostats** (slide 5)
- Install **detectors** (slide 8)
- Install **cryogenics systems** (slide 6)
- Performed full-scale prototyping of all elements: cryostat, cryogenics, detector & installation processes
- Planning for movement of all material (steel, detector components through Ross Shaft); all elements modular for transport
- Small team to be retained for DUNE Experimental Operations following installation

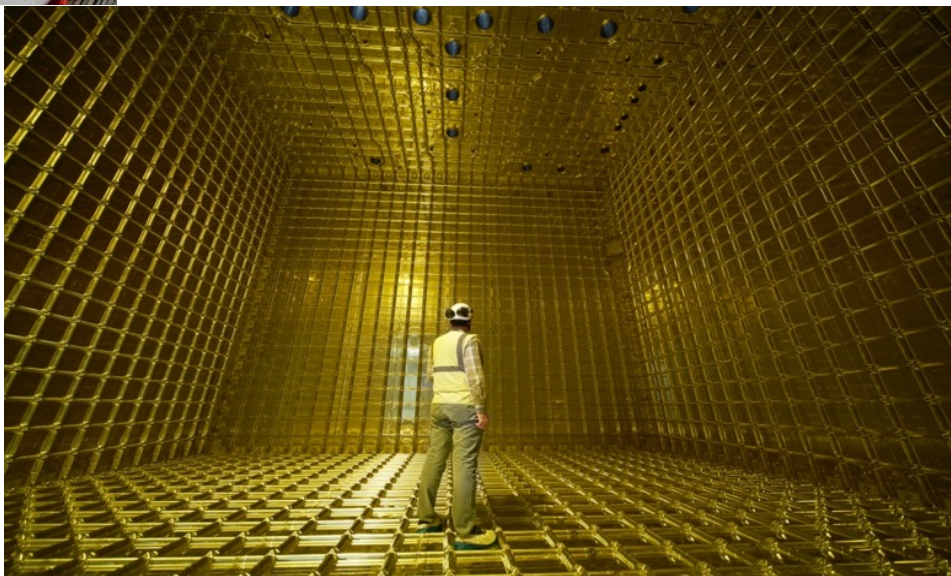
Integration & Installation Team

- Lead-based: 80, including Fermilab staff + subcontractors starting in 2024, up to 130
- Visiting: 20/year, Fermilab staff + subcontractors + visitors (other national lab & universities)

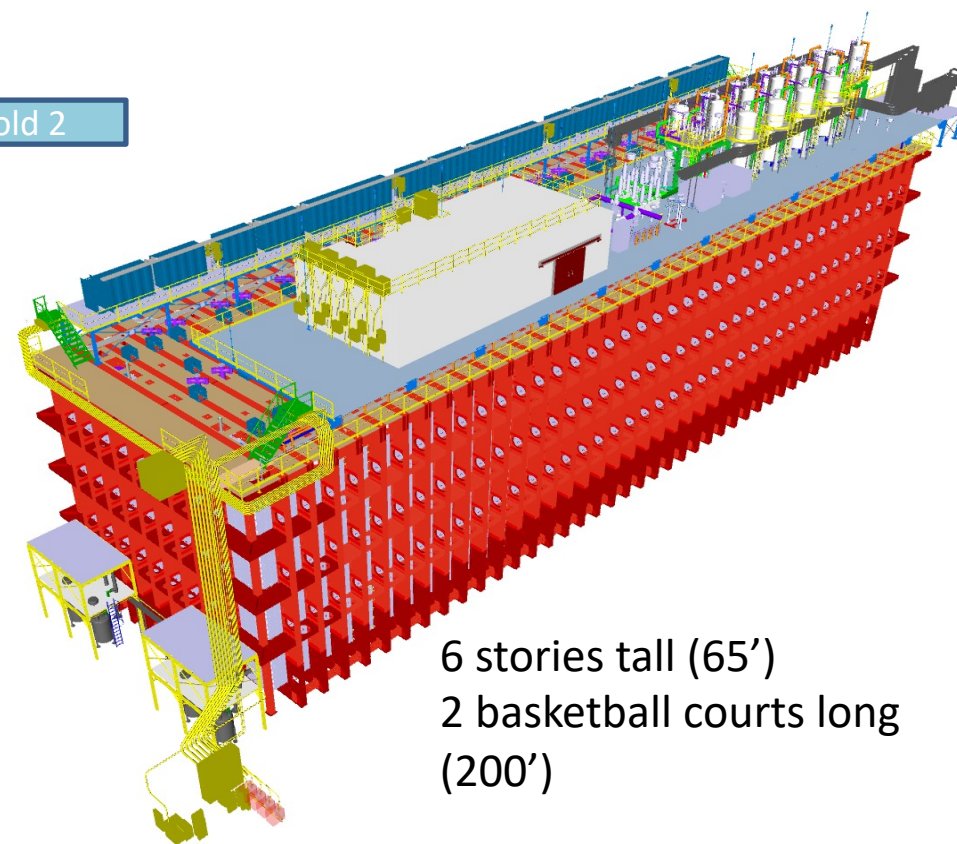


Cryostat Installation

- First activity for **Far Detector & Cryogenics (FDC)** team
- Two phases: **warm** (steel structure, left) and **cold** (insulation, bottom left)
- ~50 persons per phase
- **Warm**: mostly subcontractors (US) + non-US CERN visitors
- **Cold**: all non-US subcontractors + non-US CERN visitors



CERN = European
Organization for
Nuclear Research



6 stories tall (65')
2 basketball courts long
(200')

Internal Cryogenics #1

Internal Cryogenics #2

CERN

USA

Switzerland

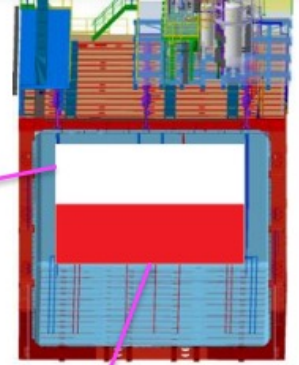
Brazil

Cryogenics work starts in mid-2026
 26 persons per month,
 increasing to 60 in mid-2027)
 US contractors (US) + non-US

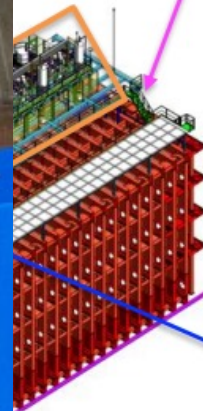
Installation of cryostats is the final LBNF

- 

FS Cryogenics International Contributions - Underground



Internal Cryogenics #2



CERN partner agreement signed in September

Far Detector Partners

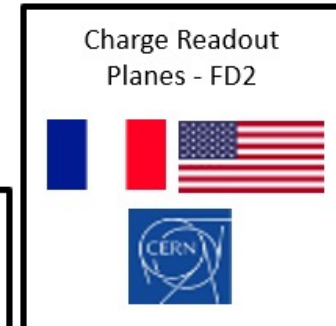
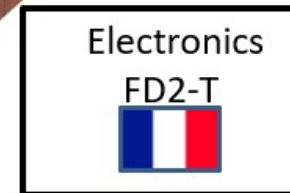
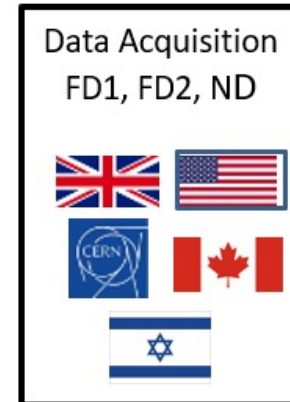
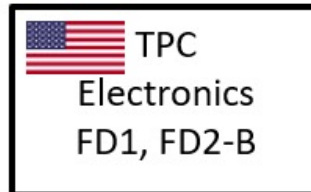
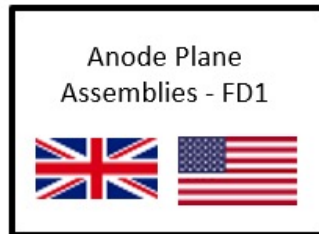
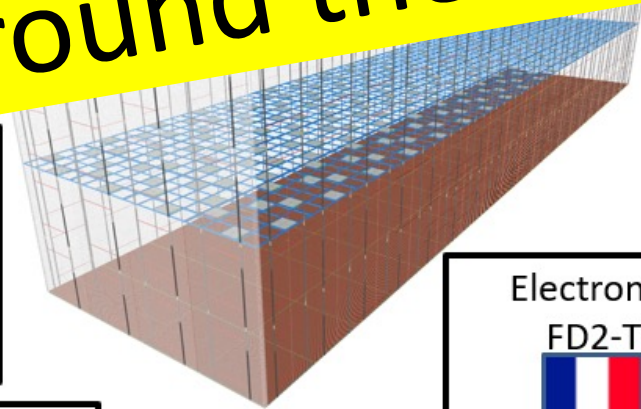
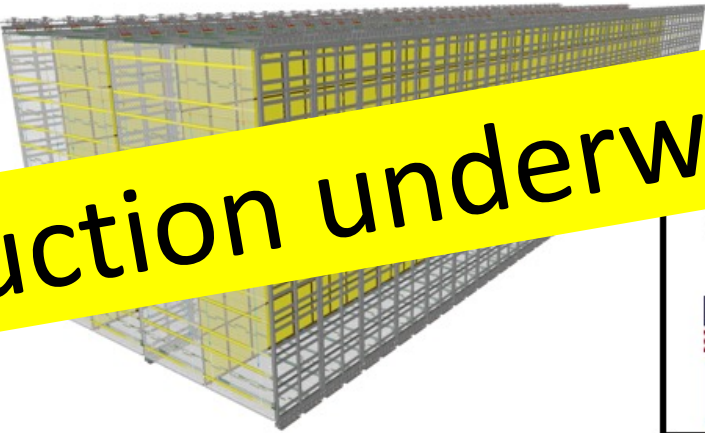
76 participants
20 institutions
October 2023

collaborators
stitutions in 33
ies + CERN
t 40 scientists / month
g mid-2026 (US/nonUS)

De
are
cry

Far Detector Partners

Production underway around the world



Detector components
are installed inside the
cryostats

- 1300+ collaborators
- 204 institutions in 33 countries + CERN
- Expect 40 scientists / month starting mid-2026 (US/nonUS)

Far Detector Partners



Partner agreement signed for Far Detectors

Detector
installed
cryostats

12.12.2023

ors
n 33

ts / month
(US/nonUS)

Building a Team to Install Detectors

- Key skills: material handling, work planning, mechanical acumen
- Hiring starts in summer 2024
- Build the world's largest neutrino detector

- Work from heights (39 feet)
- Modular components
- Operate forklifts, scissor lifts, pallet jacks
- Team of 30 technicians support cryostat & detector installation



Warm 1

Cold 1

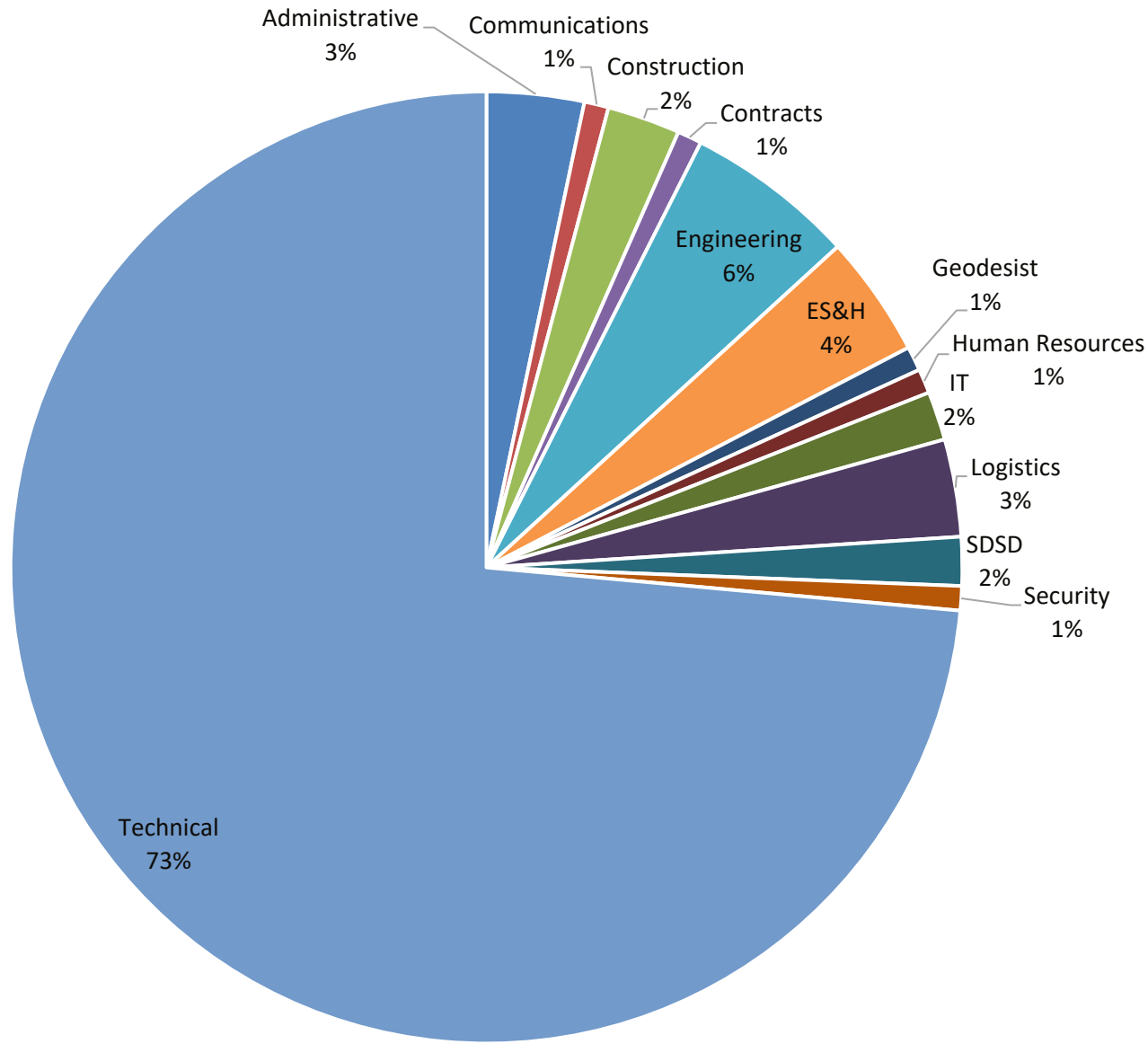
Detector 1

Warm 2

Cold 2

Detector 2

Staffing Needs



Technical

- Technicians
- Technical Specialist
- Rigging Professionals
- Construction Professionals
- Equipment Operation

2024 Hiring

Spring	Logistics Clerks Rigging Lead Designer Installation Schedule Manager Electrical Engineer Installation Manager Deputies Electrician Leads Mechanical Technician Lead Mechanical Technicians
Summer	Survey Lead Transport Lead Mechanical Technicians
Fall/Winter	Safety Coordinators Mechanical Technicians Computing System Analyst Computing Desktop Support Maintenance/Operations Engineer Maintenance/Station Engineer Maintenance Service Contracts Manager Maintenance Service Contracts Administrator Fire Protection Technician Environmental Waste Technical Specialist

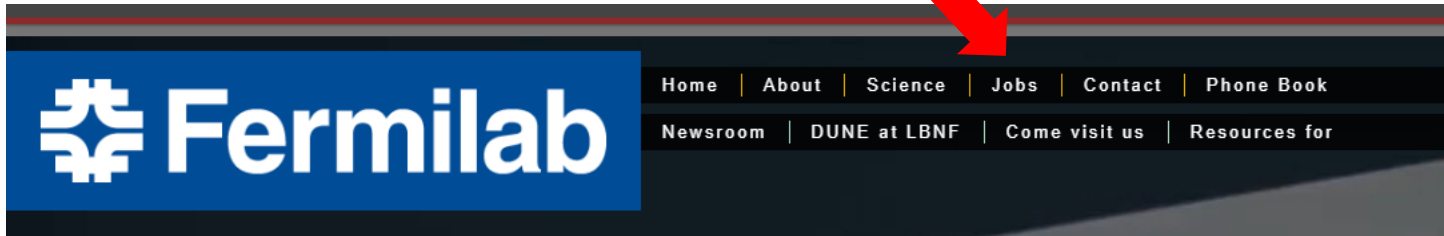
Hot Jobs

- Construction Specialist- Currently posted
- Global Services Associate- Currently Posted
- Designer- Currently Posted
- Logistics Clerk- Soon to be posted
- Installation Manager Deputies- Soon to be posted
- Installation Schedule Manager- Soon to be posted



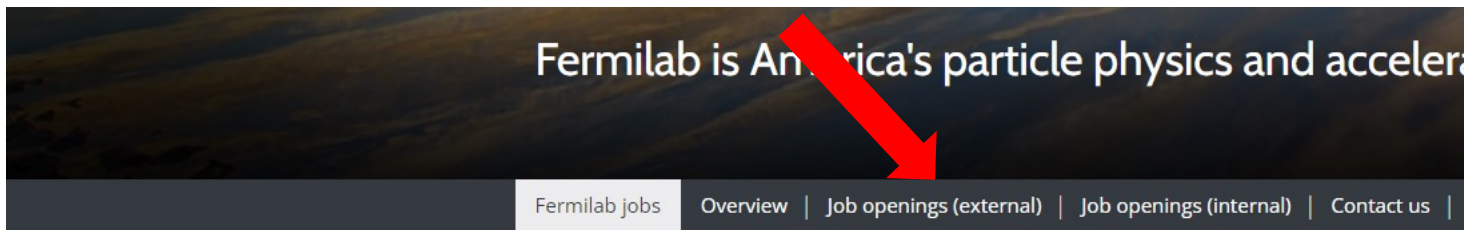
How to Apply

1.



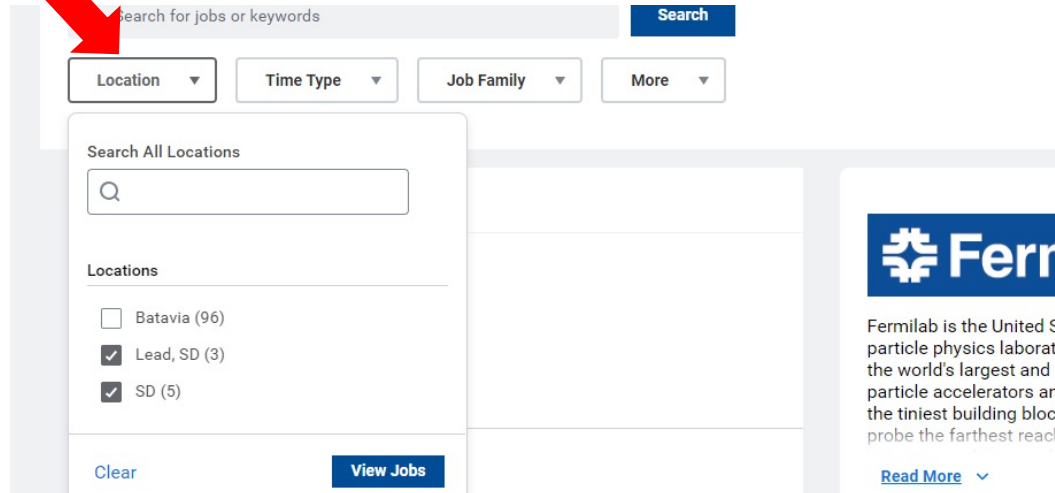
Navigate to fnal.gov
Select Jobs

2.



Select Job Openings (external)

3.



Search for jobs or keywords Search

Location ▼ Time Type ▼ Job Family ▼ More ▼

Search All Locations

Q

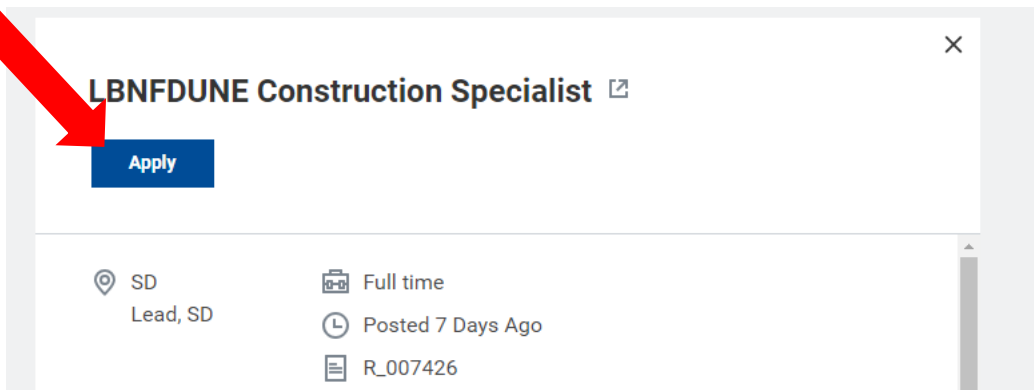
Locations

- ☐ Batavia (96)
- ☒ Lead, SD (3)
- ☒ SD (5)

[Clear](#) [View Jobs](#)

Select the desired location

4.



LBNFDUNE Construction Specialist [🔗](#)

[Apply](#)

[📍](#) SD
Lead, SD

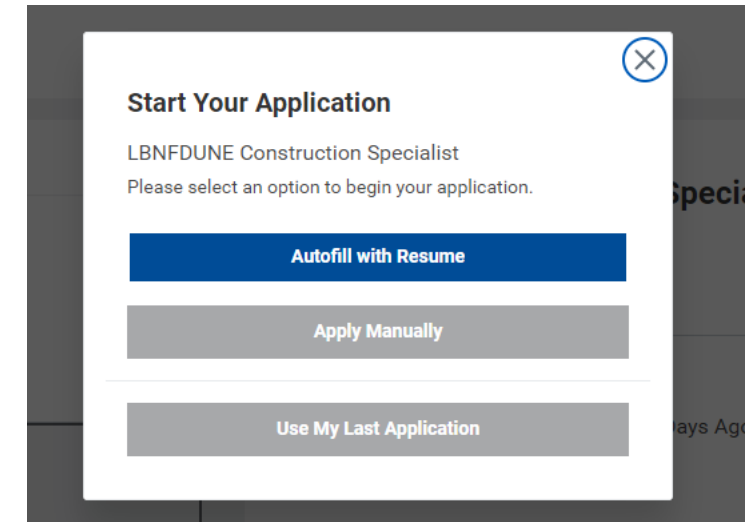
[🕒](#) Full time

[🕒](#) Posted 7 Days Ago

[📄](#) R_007426

Find position and select apply

5.



[✕](#)

Start Your Application

LBNFDUNE Construction Specialist

Please select an option to begin your application.

[Autofill with Resume](#)

[Apply Manually](#)

[Use My Last Application](#)

Complete application and upload resume

Events- Come Visit Us

Ellsworth AFB Transition Assistance Program	December 09, 2023
South Dakota School of Mines & Technology	February 07, 2024
Western Dakota Tech	February 07, 2024
Mitchell Technical College	February 22, 2024
Black Hills State University	February 29,2024
The Monument Black Hills Regional Job Fair	March 06, 2024

Contact Us

- Luke Mickelson- HR Generalist
630-391-3185
lukeqmic@fnal.gov
- Katie Lutz- Recruiter
224-575-0633
klutz@fnal.gov

For More Information

Lbnf-dune.fnal.gov



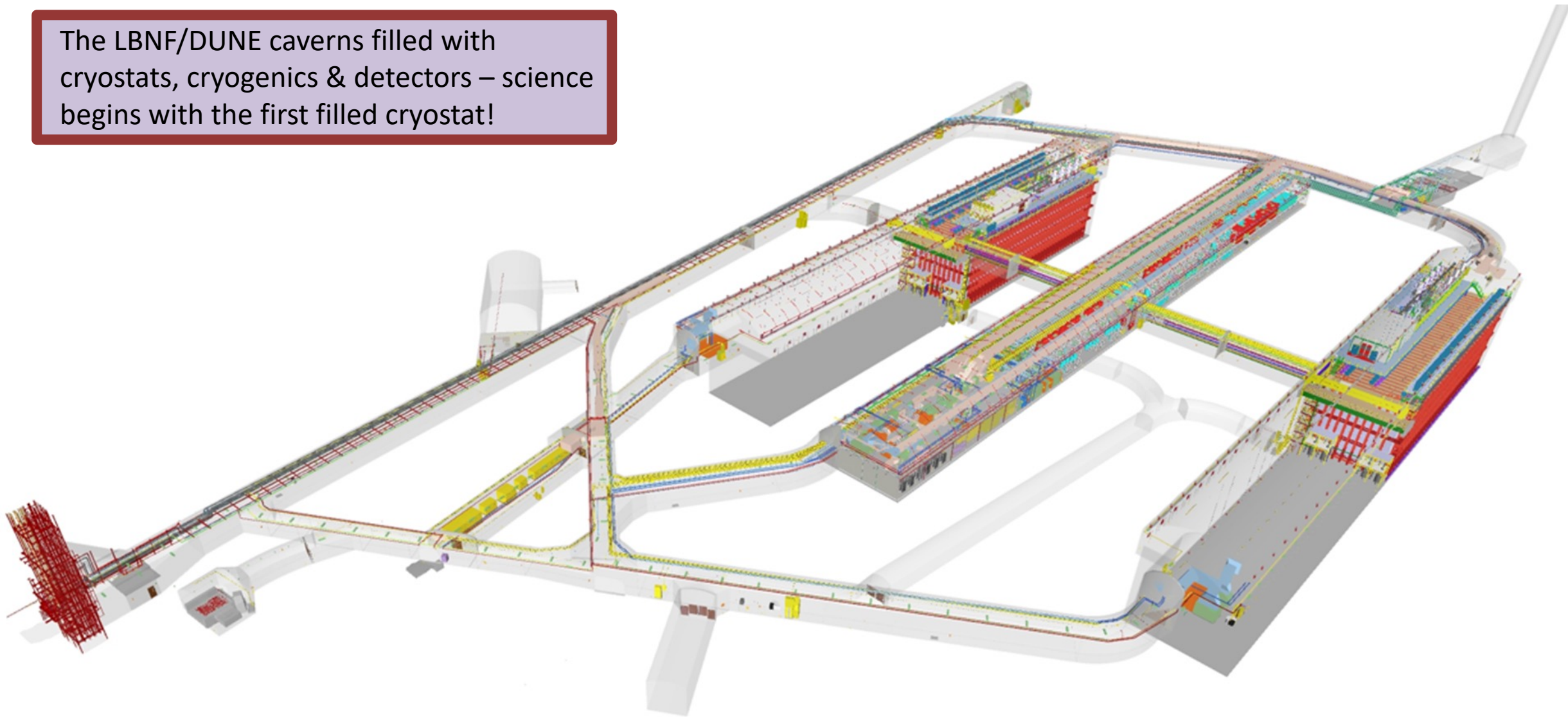
FDC Logistics/Transportation/Traffic

- Current LBNF/DUNE truck traffic 20 trucks per week
- Anticipated LBNF/DUNE/FDC truck traffic 15-20 trucks per week
 - Anticipate exclusion of weekends through 2025
 - Anticipate max 45 ft trailers, 53 ft proven to make transport route
- Mill St. remains main route for deliveries to SURF based upon guidance from City of Lead
- First 2 pieces of cryostat steel arrive in January for testing and trials
- Deliveries to Ross Campus expected to begin at onset of construction in late 2024
 - Steel coming to Black Hills region for storage starting in Apr/May from CERN





The LBNF/DUNE caverns filled with cryostats, cryogenics & detectors – science begins with the first filled cryostat!



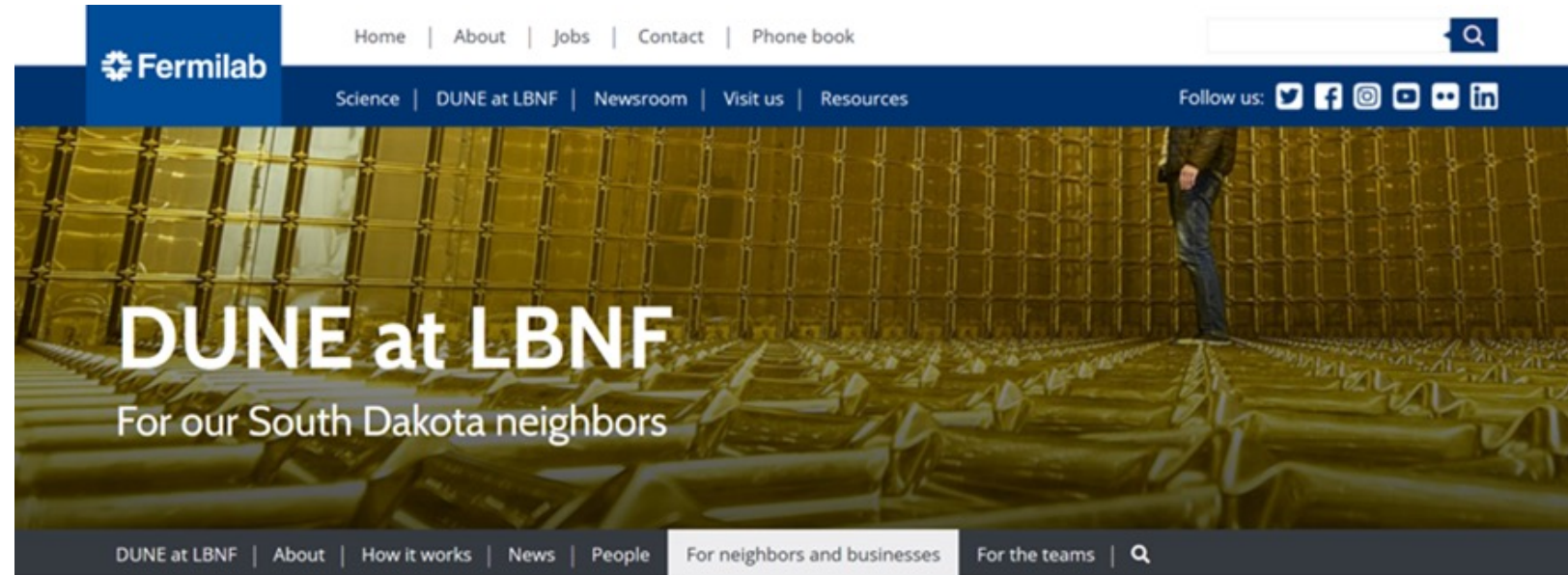
SDSTA Update

Mike Headley / Will McElroy

Questions?

Additional Resources

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- <https://fermilab.jobs/>



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