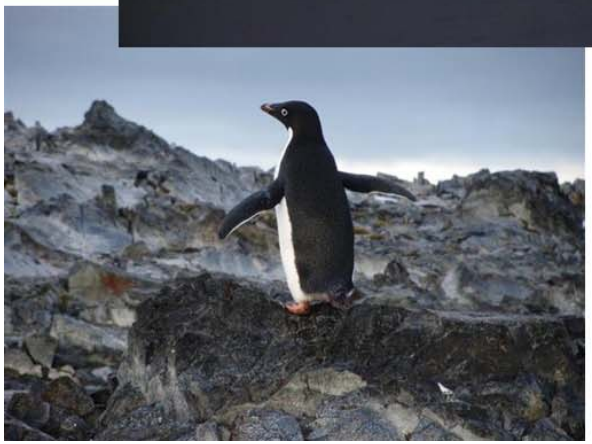
McMurdo Station, Antarctica
NSF Large Facilities Presentation

McM Station 1957- Navy (Early)

McM Station 1977- Navy (Late)

McM Station 2013 - Current

US Antarctic Program Science



NSF ANTARCTIC SCIENCES MISSION

NSF funds 150-200 science events each year across broad range of disciplines and Antarctic locations

- Fundamental research and education:
  - to understand the Antarctic regions and linkages to global systems
  - to use polar regions as unique laboratories to understand the Earth, life, and the Universe
- Training the next generation of scientists
- Educating the public - why Antarctica matters to us and to the nation

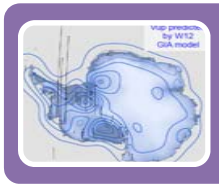
NSF ANTARCTIC RESEARCH PROGRAMS

Ocean
Atmosphere

Glaciology

Integrated System Science

Origins of the universe
Climate change
Ocean level rise
Origins of cosmic rays
Subatomic neutrino detection
Ozone hole measurements
Meteorites from other planets
Expansion of the universe
New dinosaurs
…and much more.

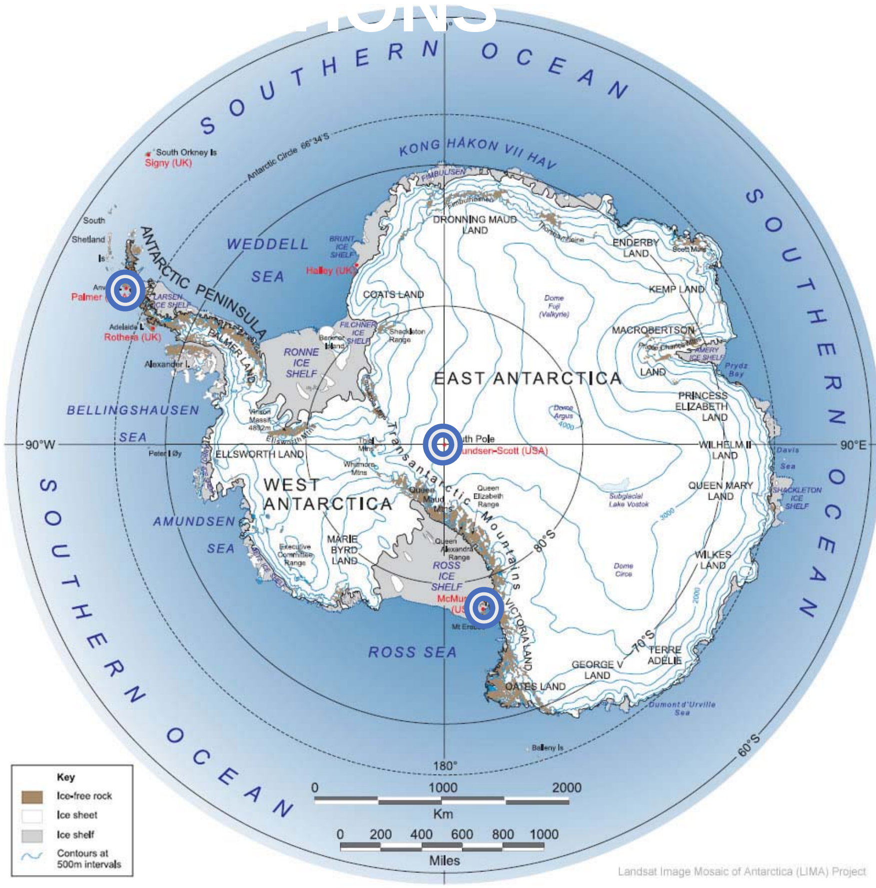


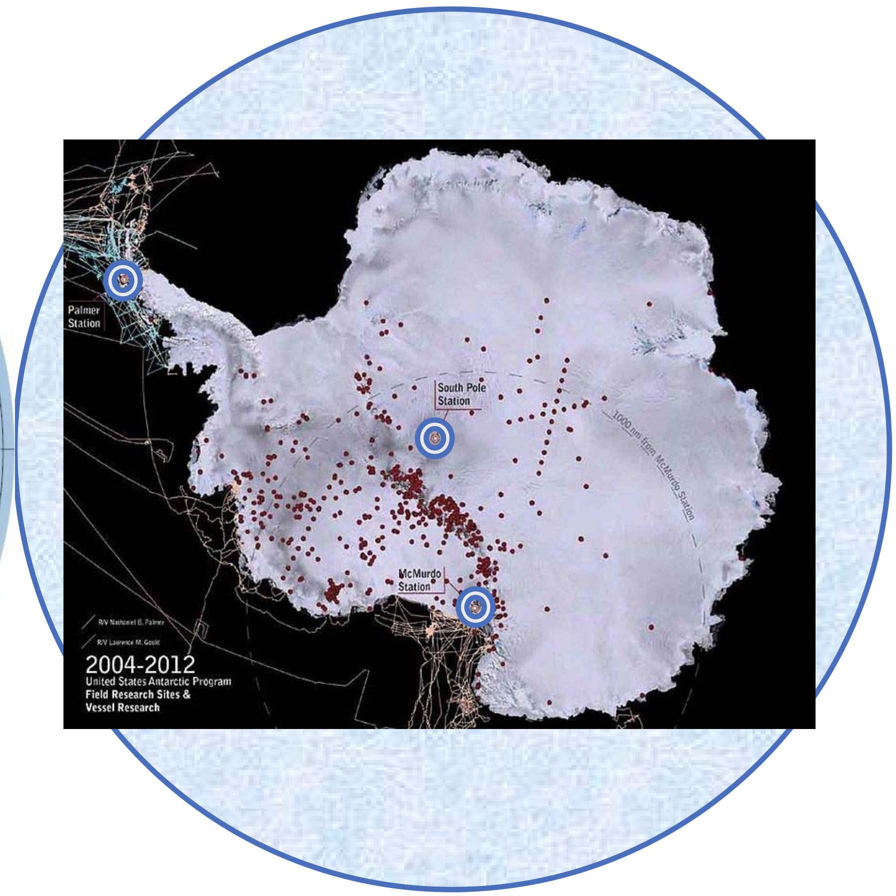
Earth sciences

Organisms and Ecosystems

Astronomy, Astrophysics, and Geospace

Instrumentation Facilities

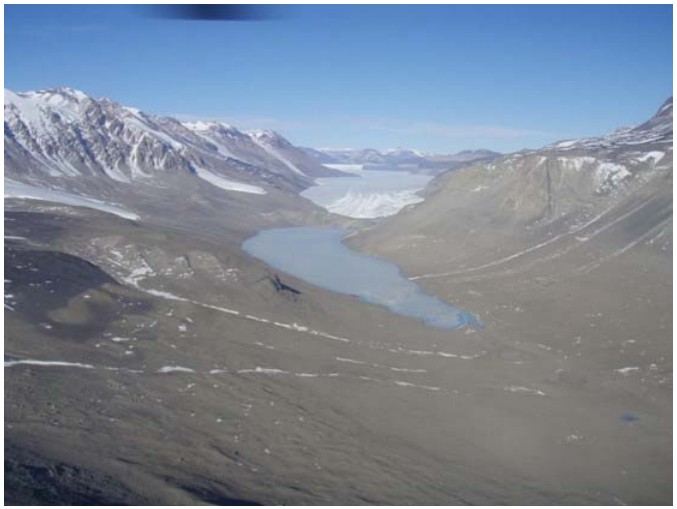

SOUTHERN OCEAN
KONG HÅKON VII HAV
South Orkney Is
Signy (UK)
Antarctic Circle 66°34'S
South Shetland Is
Palmer
Rothera (UK)
Adelaide I.
Alexander I.
ANTARCTIC PENINSULA
PALMER LAND
WEDDELL SEA
BRUNT ICE SHELF
Halley (UK)
LARSEN ICE SHELF
FILCHNER ICE SHELF
RONNE ICE SHELF
Berkner Island
Shackleton Range
COATS LAND
DRONNING MAUD LAND
ENDERBY LAND
KEMP LAND
MACROBERTSON LAND
AMERY ICE SHELF
Prydz Bay
PRINCESS ELIZABETH LAND
Dome Fuji (Valkyrie)
Dome Argus
EAST ANTARCTICA
BELLINGSHAUSEN SEA
Peter I Øy
Vinson Massif 4892m
ELLSWORTH LAND
South Pole
Amundsen-Scott (USA)
Transantarctic Mountains
WILHELM II LAND
Davis Sea
SHACKLETON ICE SHELF
QUEEN MARY LAND
Subglacial Lake Vostok
WEST ANTARCTICA
AMUNDSEN SEA
MARIE BYRD LAND
Executive Committee Range
Queen Elizabeth Range
Queen Alexandra Range
ROSS ICE SHELF
McMurdo (USA)
Mt Erebus
VICTORIA LAND
Dome Circe
WILKES LAND
ROSS SEA
GEORGE V LAND
TERRE ADÉLIE
OATES LAND
Dumont d'Urville Sea
Balleny Is
90°W
90°E
180°
80°S
70°S
60°S
Key
Ice-free rock
Ice sheet
Ice shelf
Contours at 500m intervals
0 1000 2000
Km
0 200 400 600 800 1000
Miles
Landsat Image Mosaic of Antarctica (LIMA) Project


Palmer Station
South Pole Station
McMurdo Station
1000 nm from McMurdo Station
R/V Nathaniel B. Palmer
R/V Laurence M. Gould
2004-2012
United States Antarctic Program
Field Research Sites &
Vessel Research

McMurdo Local & Sea Ice

McMurdo Based: Dry Valleys

- **Unique highly sensitive environment, near field**
- **Helicopter supported**
- **Semi-permanent camp locations**



McMurdo Based: Deep Field

- **Wide range of remote locations across the continent**
- **Primarily supported by fixed wind aircraft (LC-130, Twin Otter) out of McMurdo**
- **Secondarily supported by heavy equipment traverse**
- **Broad range of science disciplines**

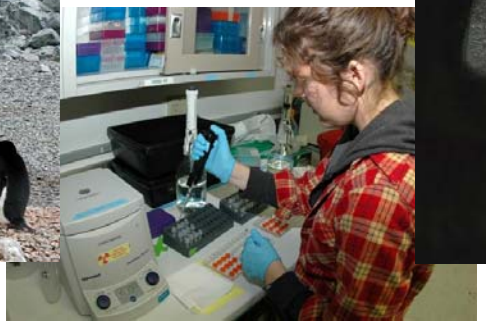
South Pole

- photo detectors deep in the ice sheet
- detect high-energy cosmic neutrinos from far space
- search for Dark Matter

- origin and early history of the Universe
- theories of Dark Energy

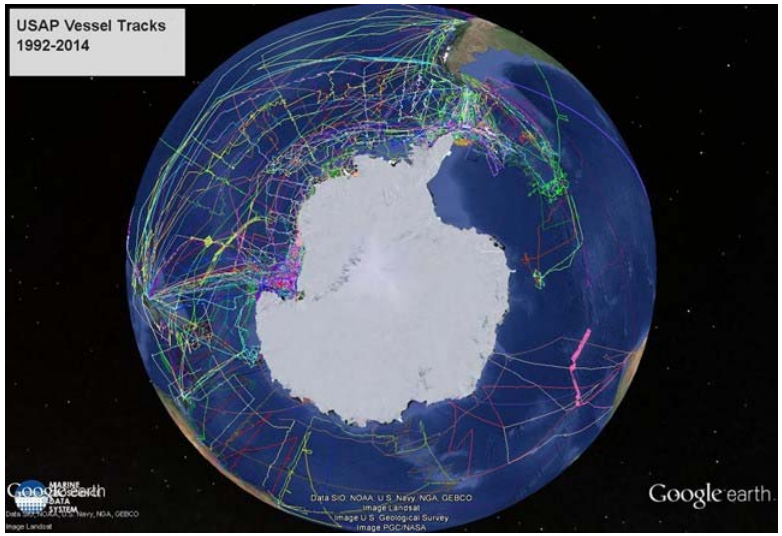
Palmer Station

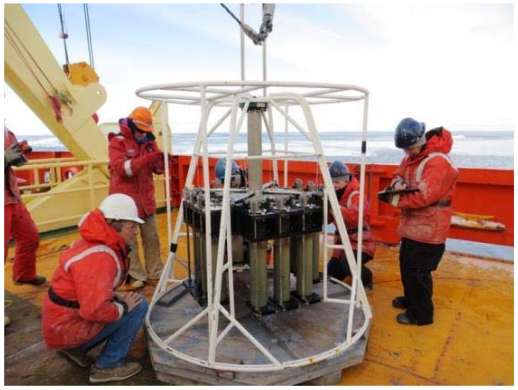
- **Palmer Station is used year round**
- **LTER has long term marine/Palmer ecological studies**
- **Ongoing installed instruments for NOAA, CTBT and others**
- **On-going bird and other wildlife projects**
- **Supported by Research Vessels**



Research Vessels

- **USAP Operates two research vessels: *Laurence M Gould (LMG)* and *Nathaniel B Palmer (NBP)* under charter to the ASC for the National Science Foundation (NSF)**
- **The ships provide support to USAP in various regions of the Antarctic and the Southern Ocean**
- **Primary functions include supporting variety of oceanographic research activities in the open ocean and in ice, as well as supporting land-based station and field programs**


USAP Vessel Tracks
1992-2014
Google earth



McMurdo Station

Project Definition

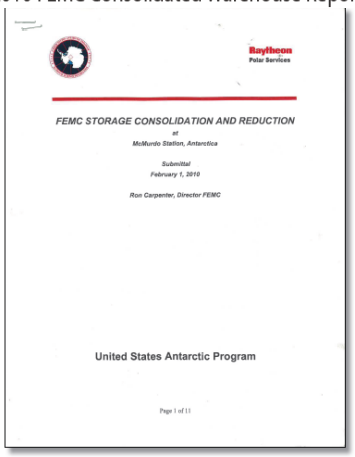
- **Master Plan 1.0 built upon all previously completed McMurdo Station studies.**

1993 Master Plan

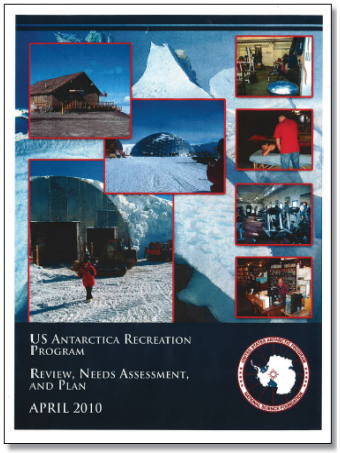
2003 Master Plan

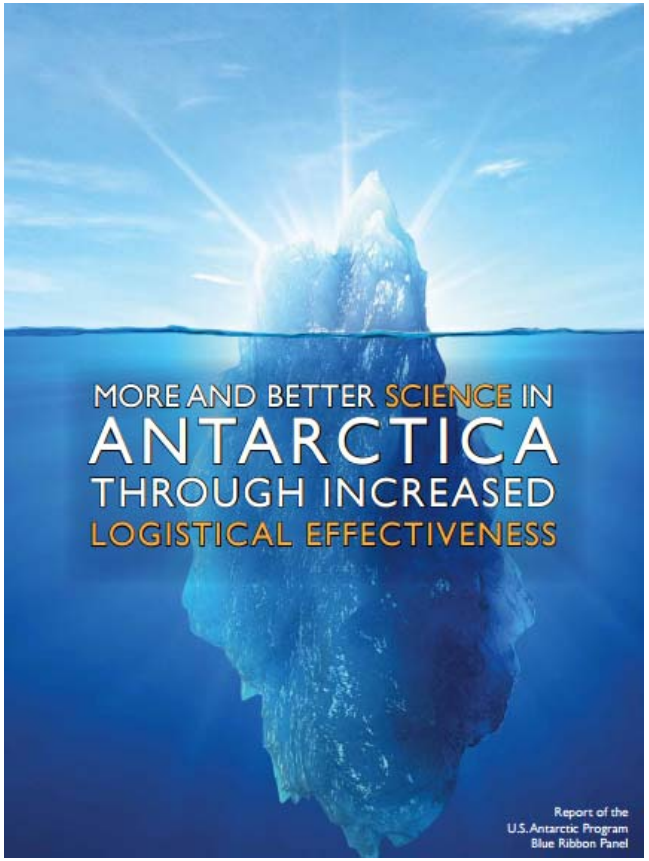
2011 Master Plan Update

2010 FEMC Consolidated Warehouse Report



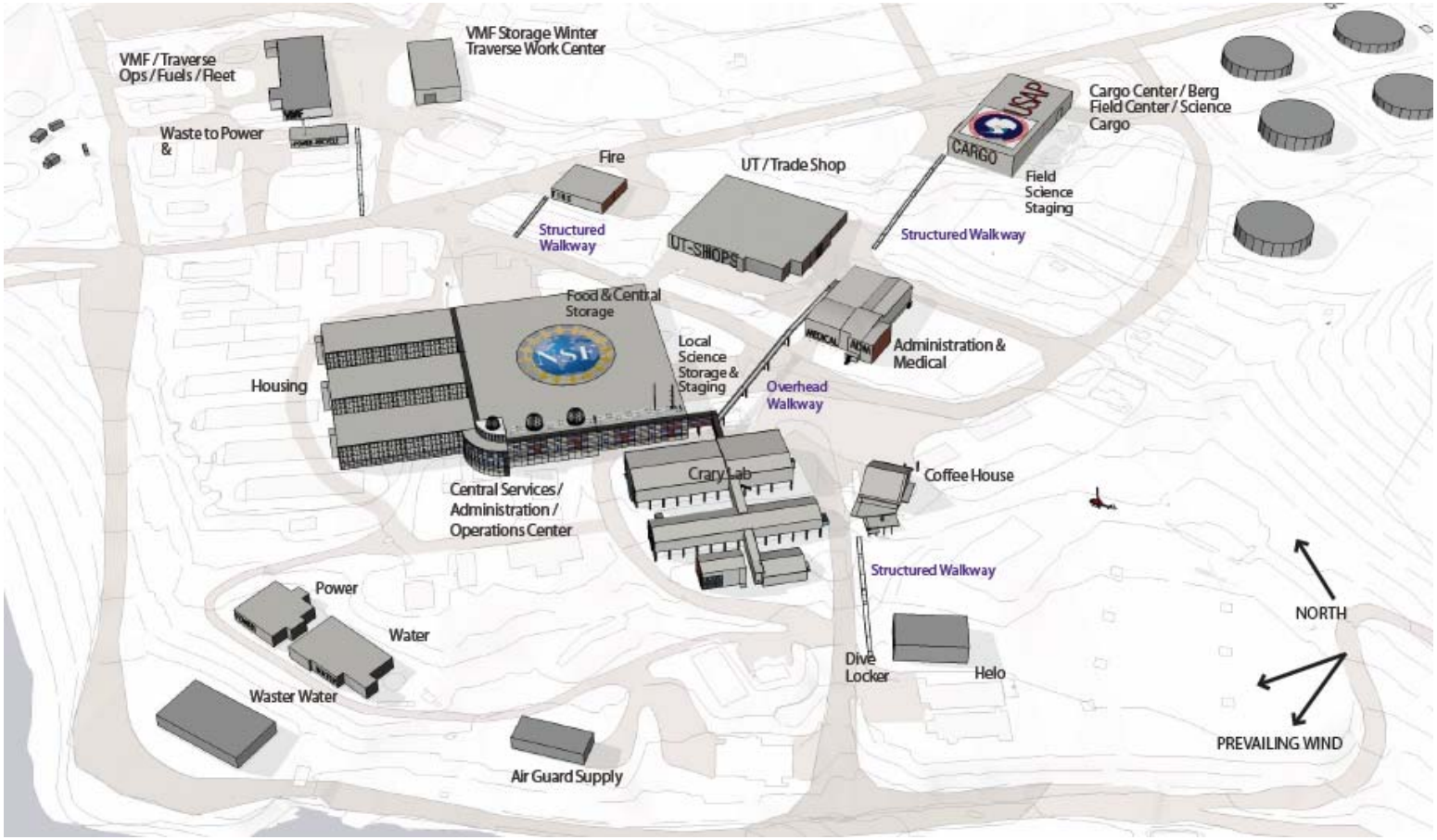
2010 Recreation Report





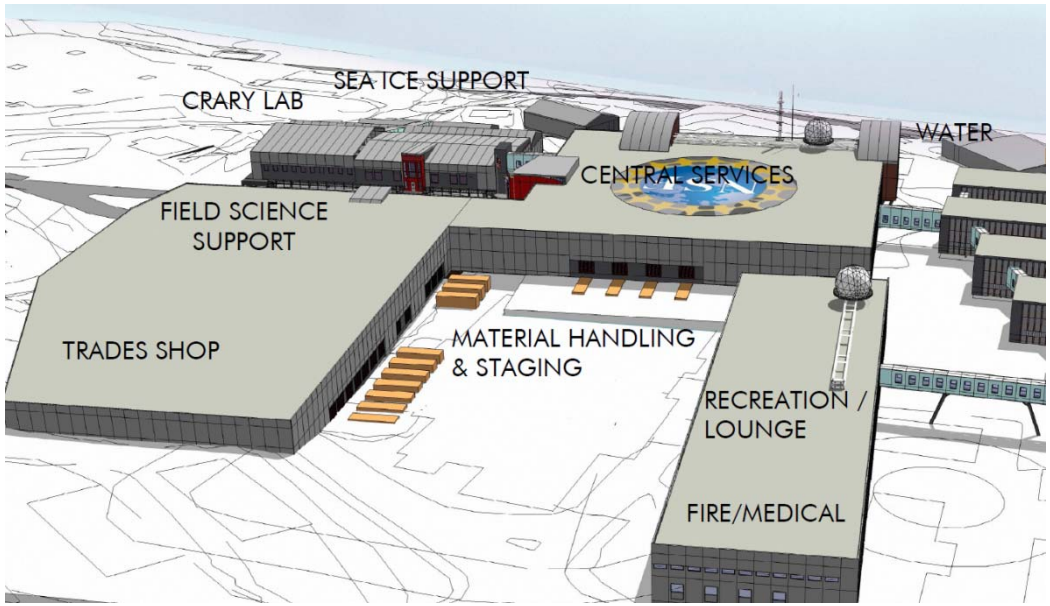
Project Definition

- **Master Plan 1.0 Final Build Out**

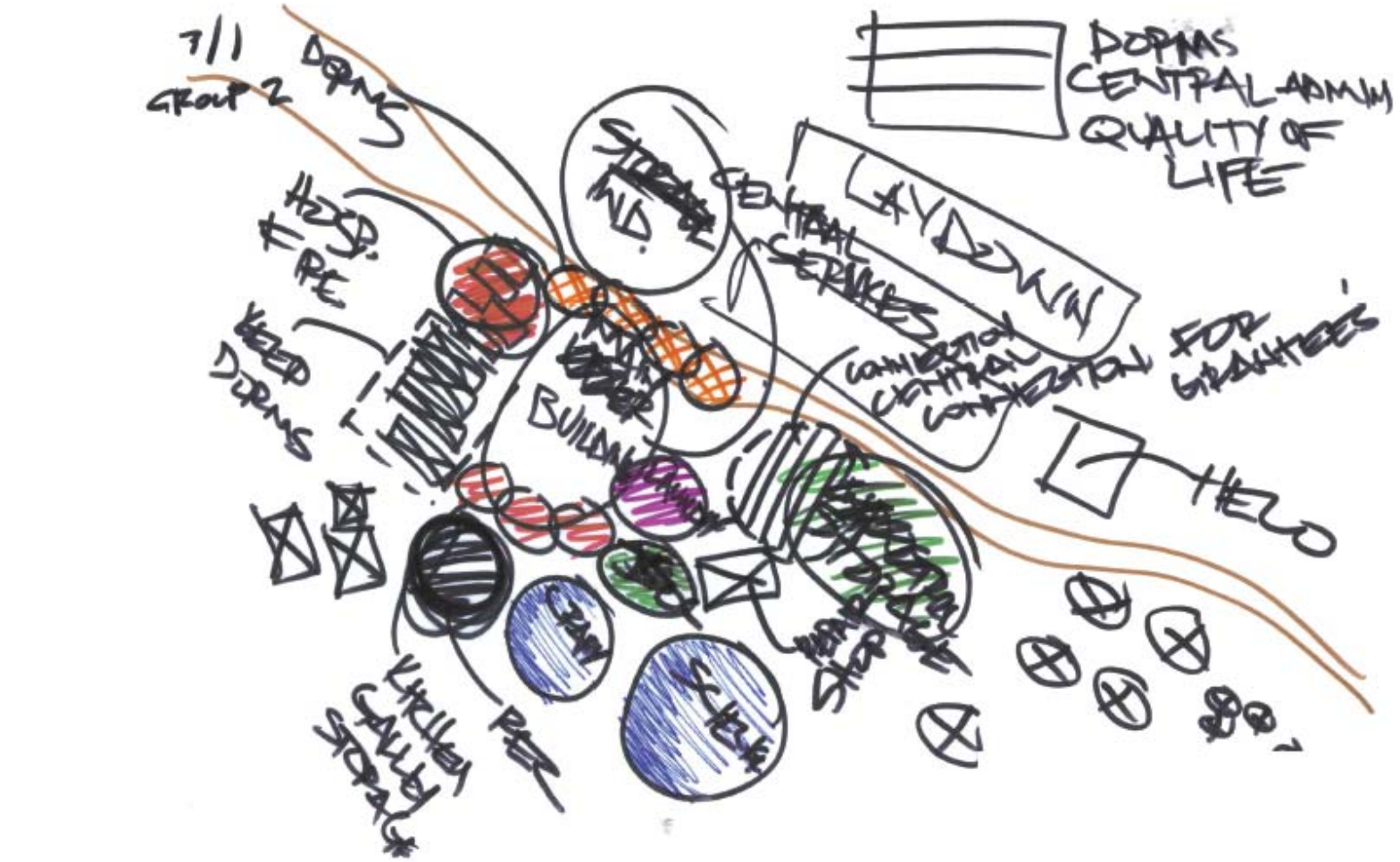


Project Definition

- **Master Plans served to define design parameters**



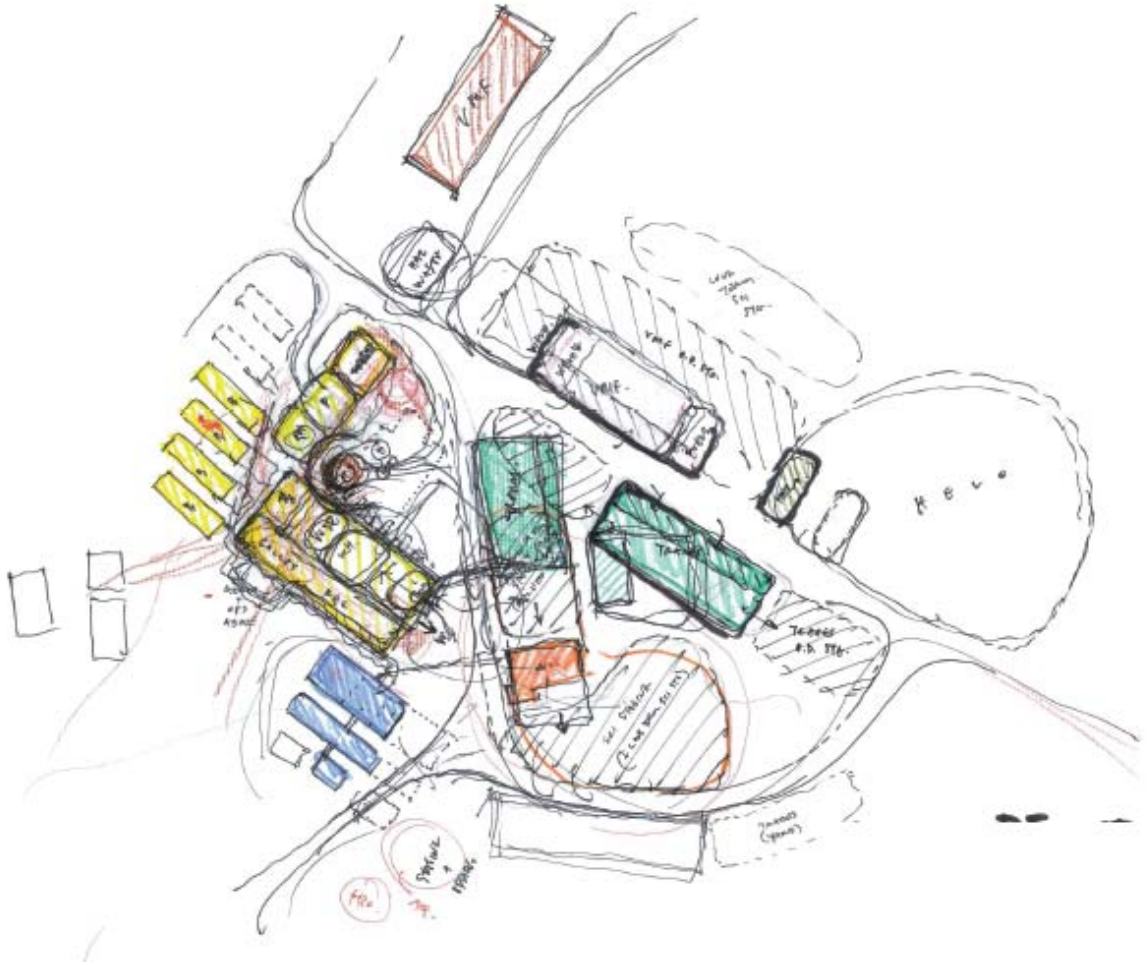
Operational Flow Development



AIMS Conceptual Design Review, 31-Mar to 2-Apr, 2015

Operational Flow Development

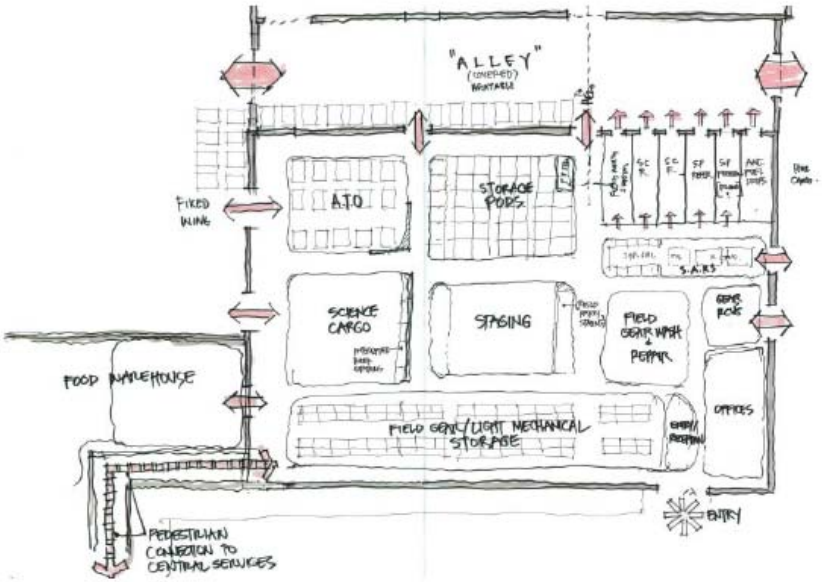
SCHEME K3 - MAXIMUM RE-USE



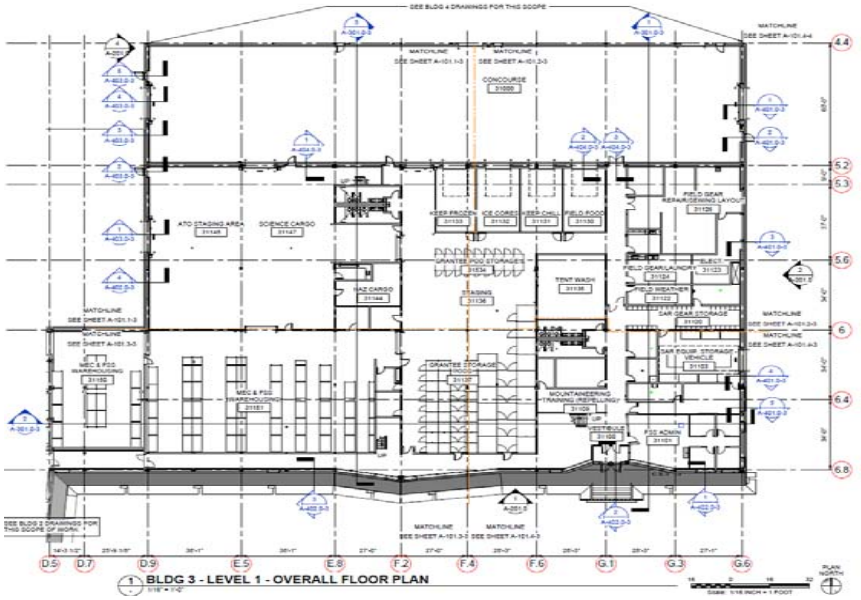
AIMS Conceptual Design Review, 31-Mar to 2-Apr, 2015

Programming Method

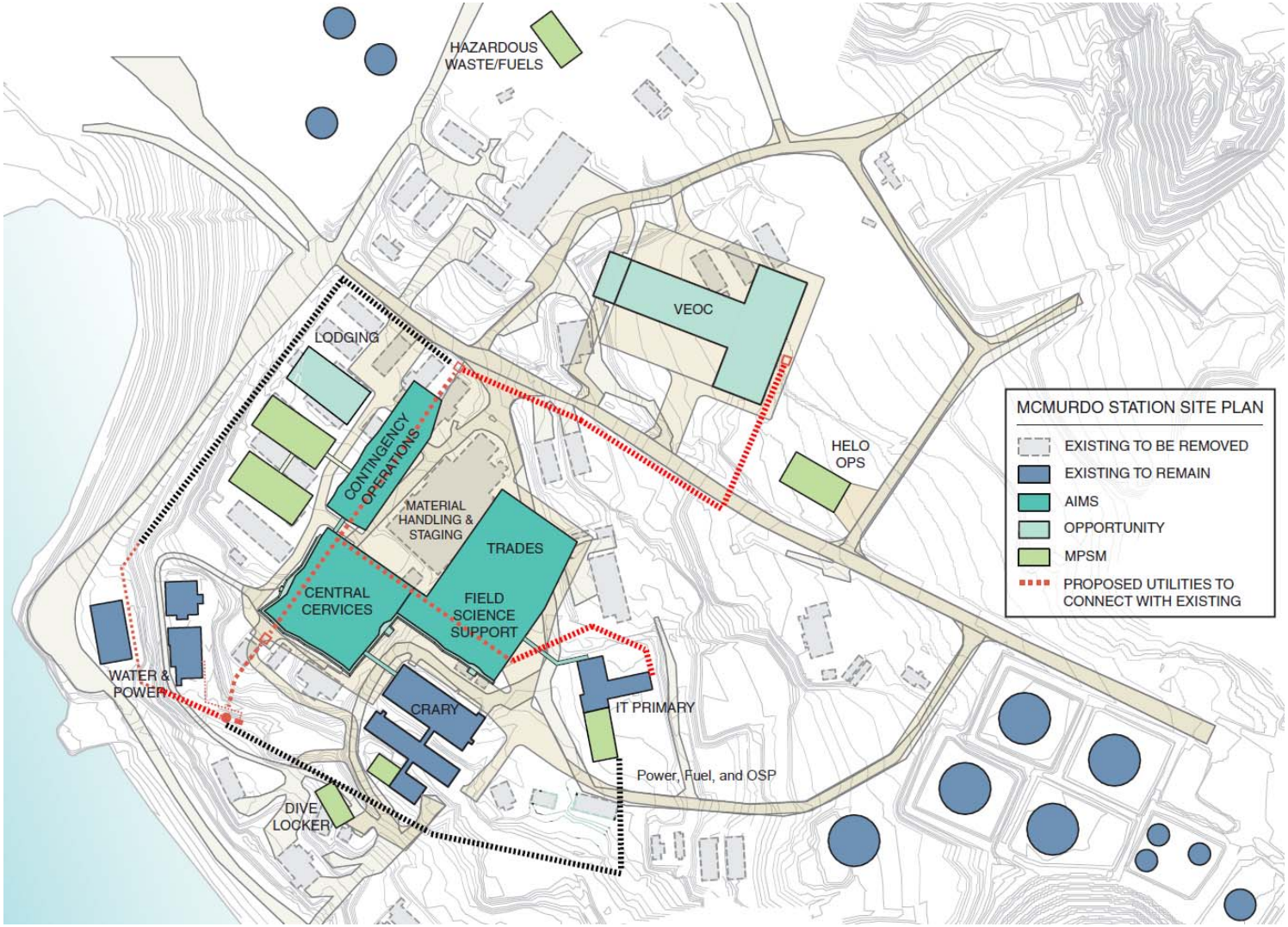
- **Field Science Support Evolution**



FIELD SCIENCE SUPPORT FACILITY ADJACENCY DIAGRAMS



AIMS and MPSM Completion



In Scope for AIMS

MCMURDO STATION FUTURE-STATE

Fewer Buildings with Denser Occupancy

- ***Less vehicle traffic, lower road maintenance***
- ***Lower total building surface area which equates to better energy efficiency***
- ***Less snow maintenance around station***

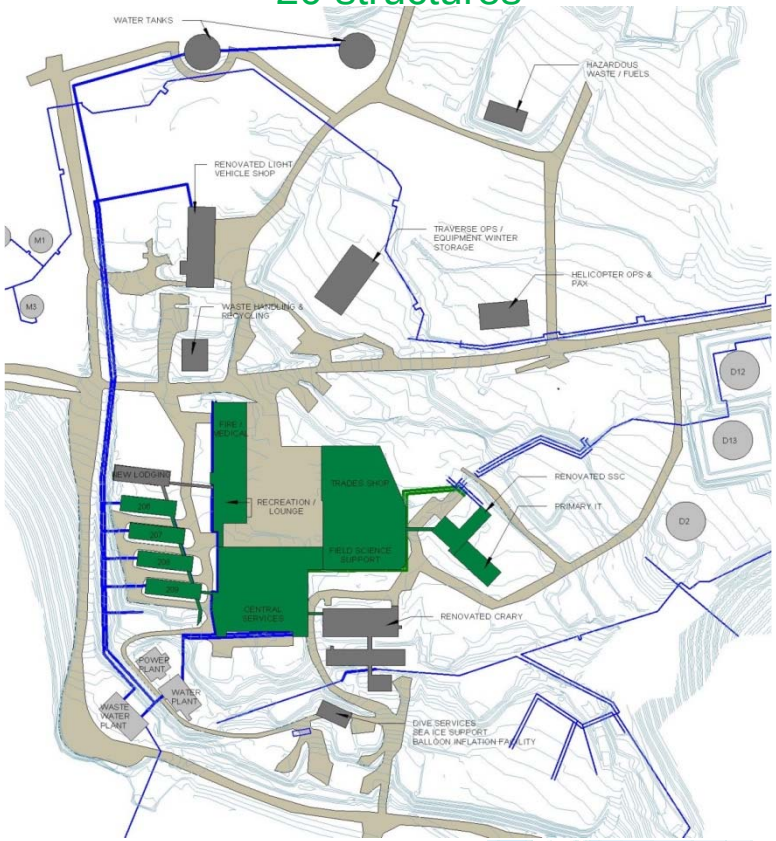
RESULT: A condensed station footprint and better utilization of space within buildings requires less staffing and a smaller vehicle fleet to execute operations

Current-state

>100 structures

Future-state

~20 structures



MCMURDO STATION FUTURE-STATE

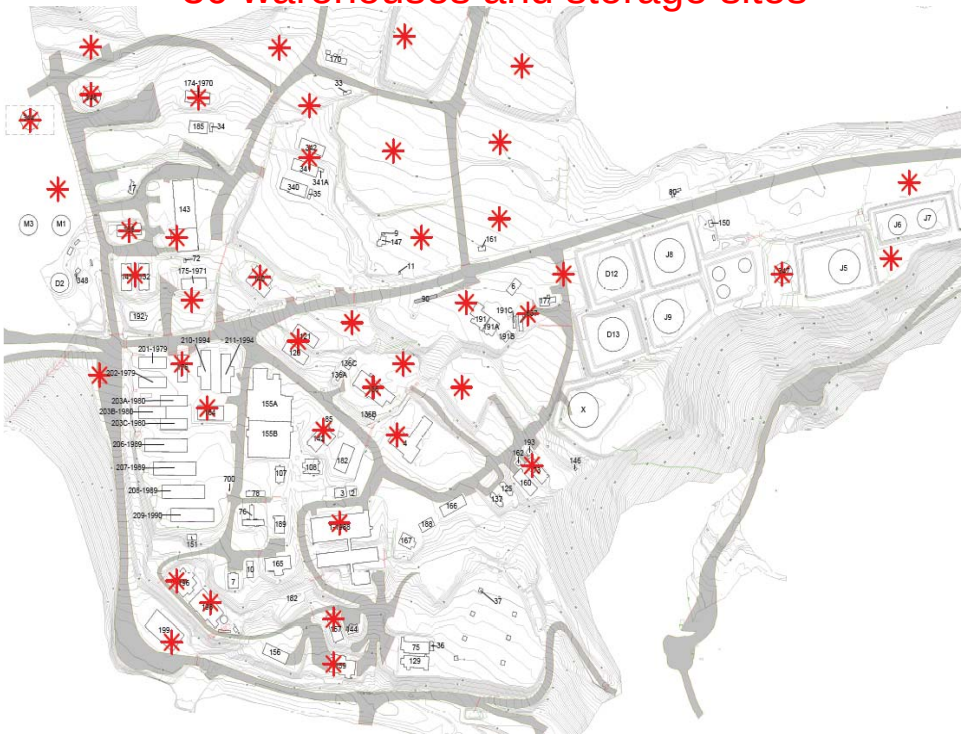
Consolidated Warehouses/Storage Locations

- ***Minimizes number of touchpoints and reduces distance between touchpoints***
- ***Reduces facilities costs/energy utilization***
- ***Consolidates Pick, Pack, Ship workflows***

RESULT: An efficient local supply chain (inventory storage and distribution) requiring less staffing, computers, and material handling equipment

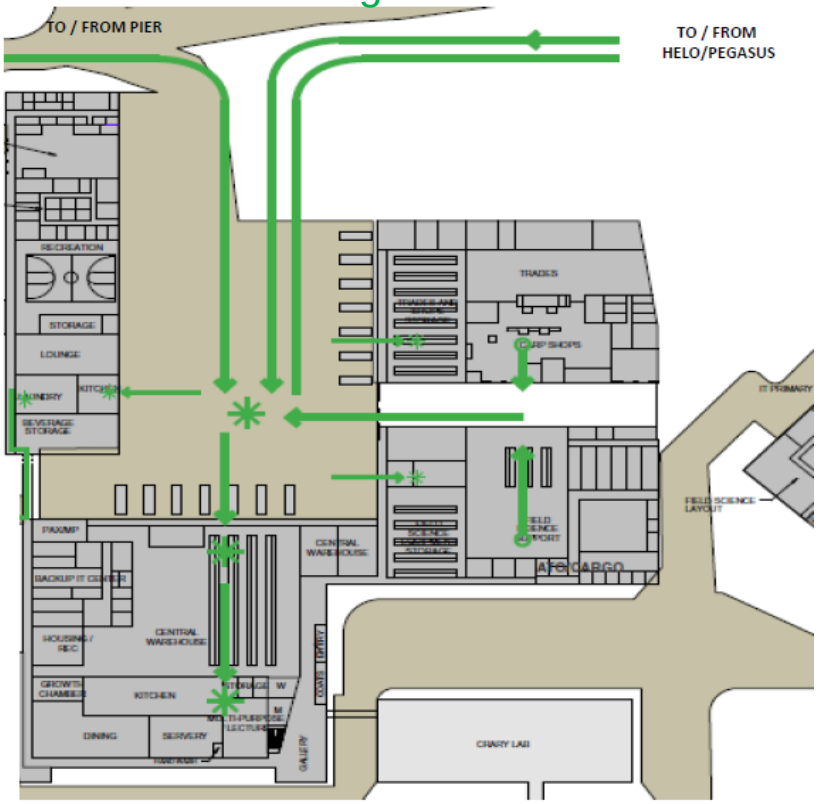
Current-state

>30 warehouses and storage sites

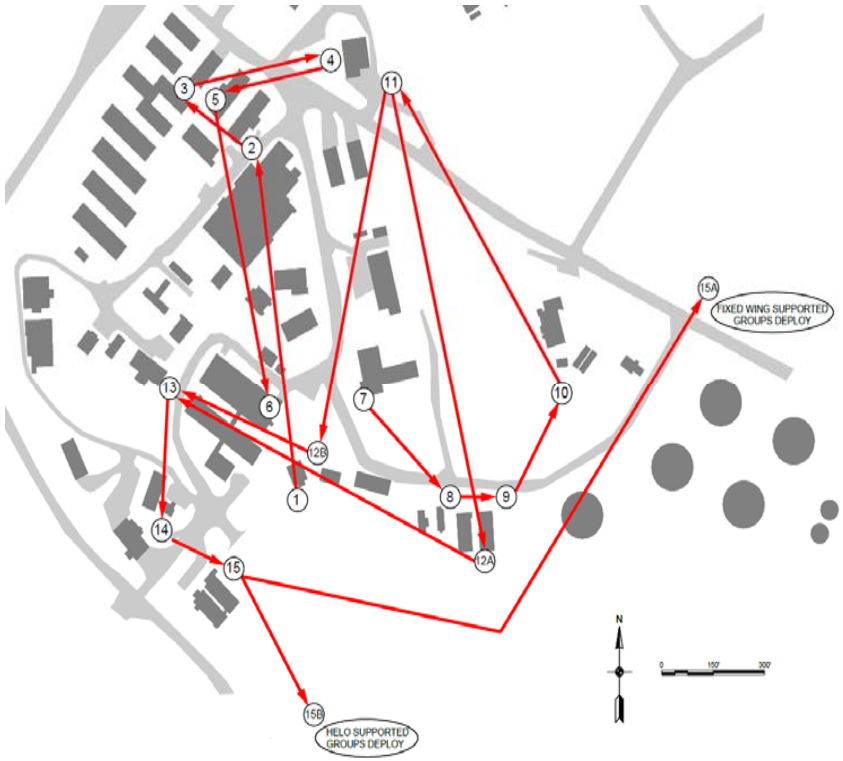


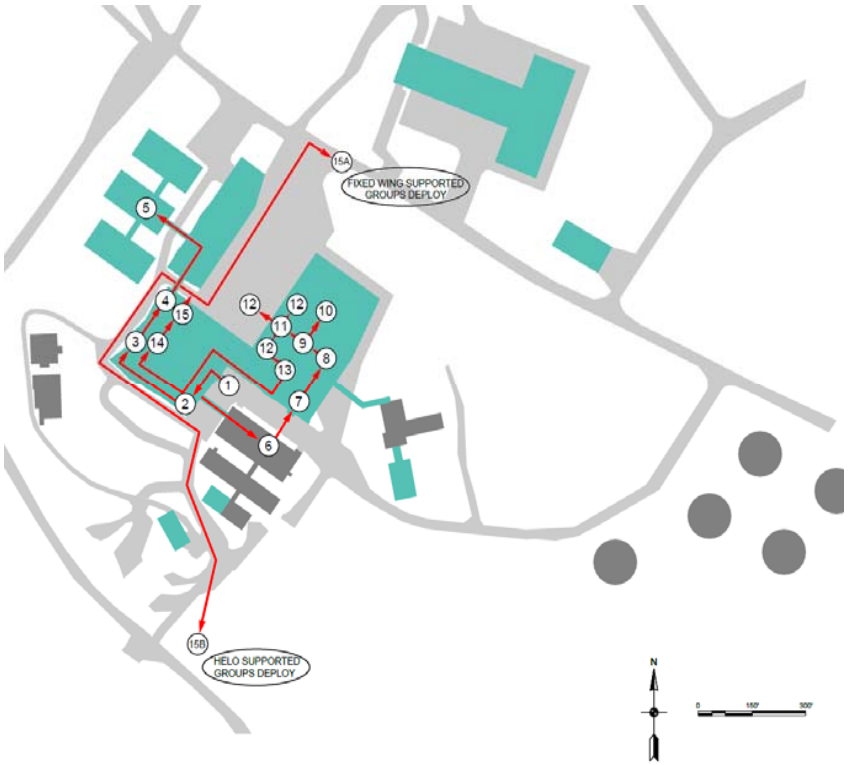
Future-state

3 storage locations



Grantee Movement Flow

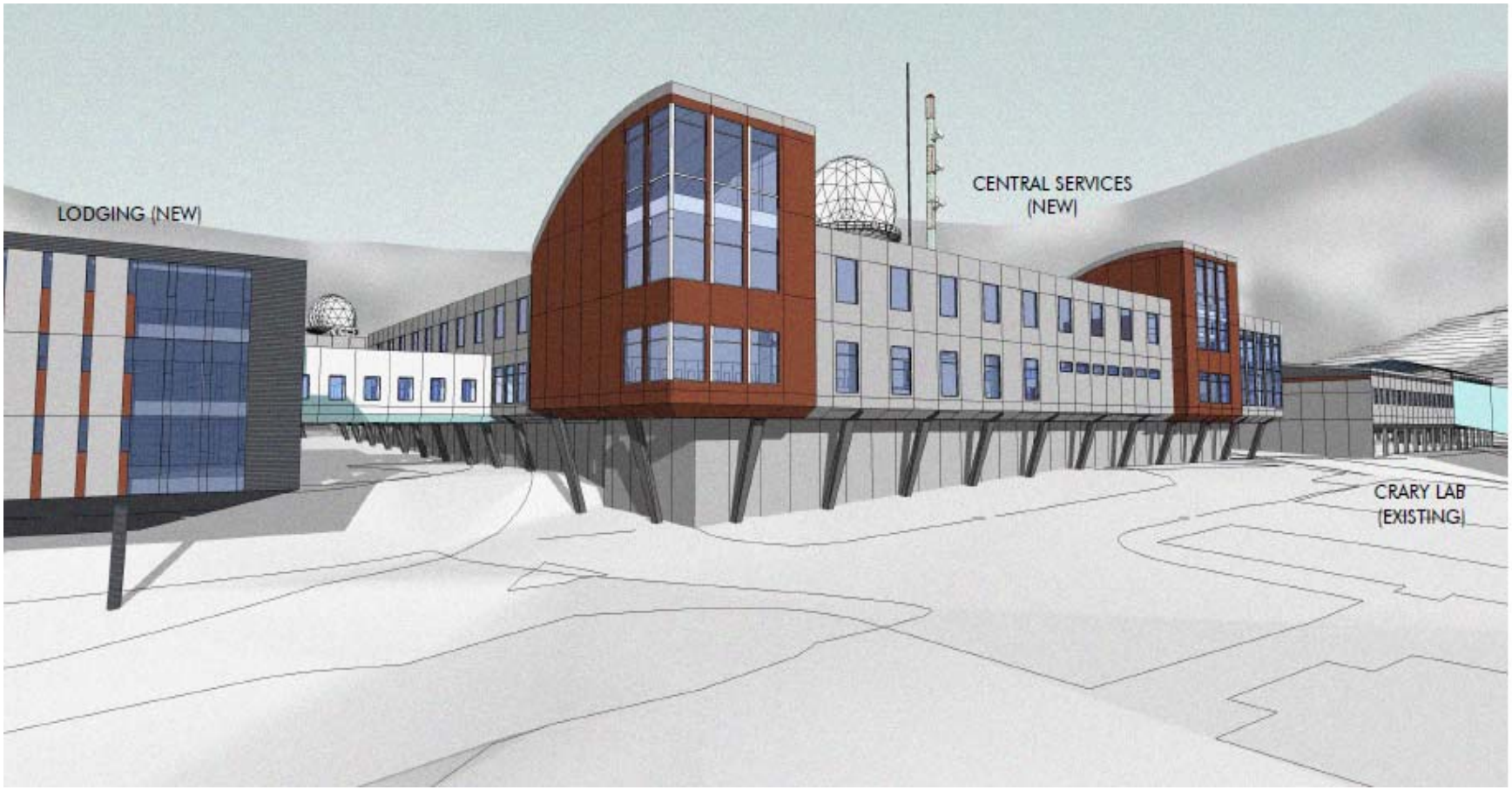




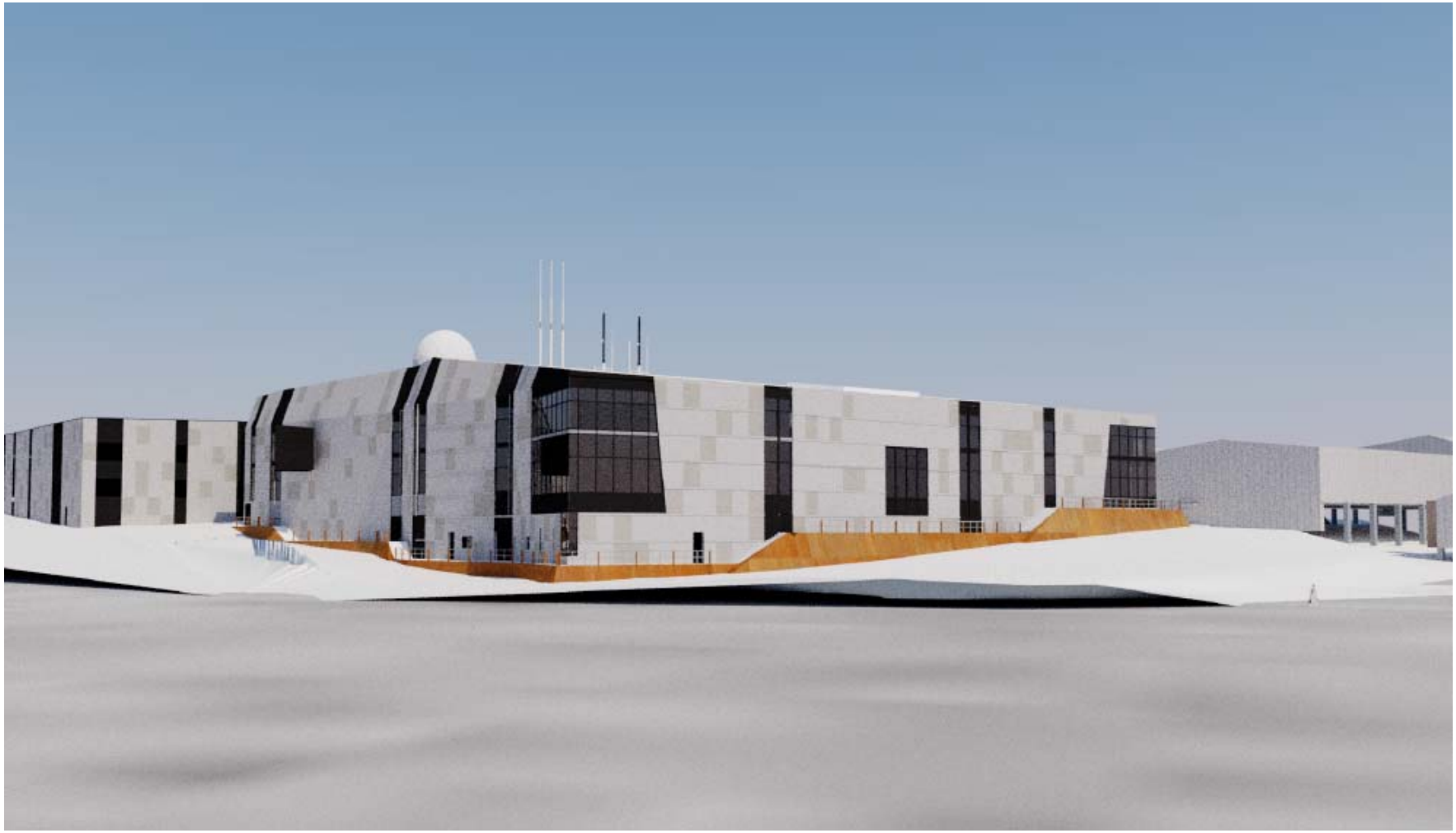
AIMS Animation

McMurdo Test MP1

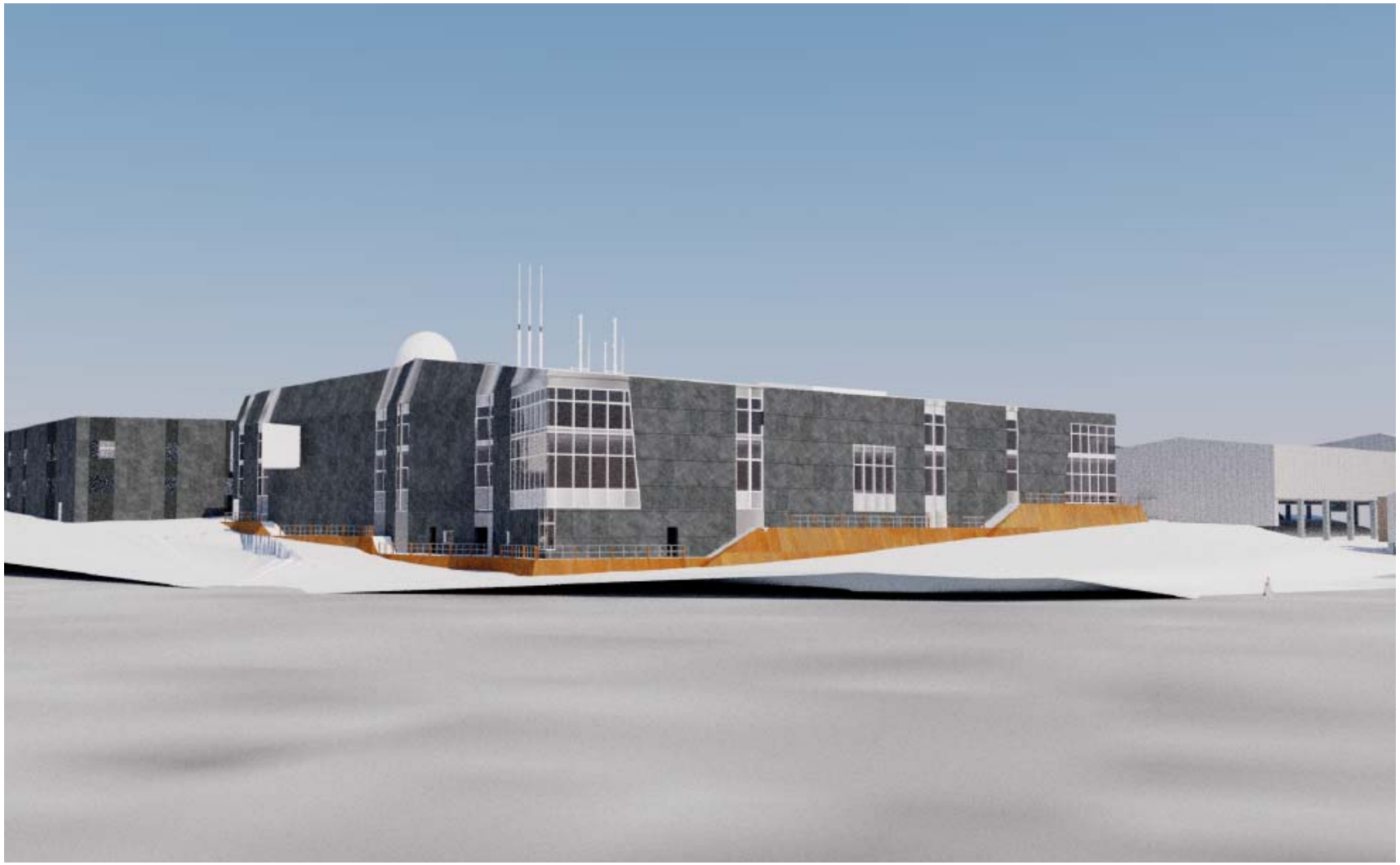
McMurdo Test MP2



McMurdo Exterior Test



McMurdo Exterior Test



McMurdo Exterior Test

McMurdo Exterior Test