U.S. Department of Health and Human Services

NIH National Institutes of Health

2015 Master Plan Update

NIH Rocky Mountain Laboratories

Prepared by the Division of Facilities Planning
Office of Research Facilities

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Concept: *A master plan examines current and desired conditions and relationships in a systems-view of constituencies, context, and built environment; the aim is to develop and maintain a roadmap to shape the built environment under consideration in ways that best support the goals of an organization and needs of its people. This 2015 Master Plan Update for the NIH Rocky Mountain Laboratories (RML) builds upon the 2009 RML Master Plan and other recent studies of the RML campus.*

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Preface

The NIH RML Master Plan Update 2015 is focused on NIH's scientific mission. It is a vision of where the NIH at the Rocky Mountain Laboratories campus aspires to be scientifically in the next 20 years. It is also a tool to help the NIH realize its vision.

The NIH RML Master Plan Update 2015 is aligned with the NIH's mission to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce the burdens of illness and disability.

The NIH RML campus is a mature collection of research, administrative and support facilities built on 36.5 acres of land. Measured analysis has revealed that some of NIH's existing facilities cannot support its mission in the near future. NIH RML Master Plan Update 2015 employs the following elements to evaluate NIH facilities and to develop proposed solutions and improvements:

- the Federal Real Property Council's Performance Measures to evaluate its existing facilities with respect to mission, utilization, operating cost, condition and disposal/remediation;
- the NIH Buildings and Facilities Model to aid in evaluating program impact, functional obsolescence, and facility impact;
- sustainability goals and good stewardship practices, such as adapting and reusing historic buildings; and
- ongoing consideration of the scientific research functions at the Rocky Mountain Laboratories and the appropriateness of the proposed building and facilities plans in place to support that mission.

The NIH RML Master Plan Update 2015 is intended to assist the NIH facilities management personnel in better understanding and managing the future facilities needs of the NIH as it correlates with research mission priorities for this campus. It emphasizes early planning and the importance of project definition. The NIH RML Master Plan Update 2015 addresses the NIH impacts on the region and its community, and concerns such as traffic, pedestrian safety, the economy, the environment, historic preservation, and sustainability. I extend my sincerest appreciation to all the people who helped to make the NIH RML Master Plan Update 2015 a reality.

D.G. Wheeland, P.E. Director Office of Research Facilities

Executive Summary

Introduction

The Rocky Mountain Laboratories (RML) is a 36.5-acre facility located in Hamilton, Montana. It is occupied by the National Institute of Allergy and Infectious Diseases (NIAID), one of the 27 Institutes and Centers of the National Institutes of Health (NIH). Satellite support organizations from the NIH Office of Research Facilities Development and Operations (ORFDO, or ORF) as well as the NIH Office of Research Services are also present at RML.

The Master Plan is an integral part of broader, long term planning efforts at the U.S. Department of Health and Human Services (HHS). HHS requires Master Plans for all of its owned campuses as well as those sites and installations occupied by HHS employees that contain at least two independent buildings, or two different activities.

The purpose of the NIH RML Master Plan 2015 Update is to define the real property assets that would support the execution of the programs housed at the NIH RML Campus and to guide new development within the campus, in support of the mission of the National Institutes of Health.

The first comprehensive master plan for RML was developed in 2009, with 2005 serving as the baseline condition. At that time, construction of the new Integrated Research Facility (IRF), physical security requirements, growing concerns in the Hamilton area about campus development and effects on natural resources, as well as increased interest within the local community about activities on the RML campus had made clear the need for a coordinated plan for future development of the site. The 2009 Master Plan, upon which this update is based, was prepared by Oudens + Knoop Architects PC, a subcontractor to LSY Architects under a contract with the NIH in collaboration with the NIH Division of Facilities Planning (DFP) and with the leadership of NIAID, certain offices within the NIH Office of the Director and the NIAID scientific and support organizations housed at RML. The Purpose of this NIH RML Master Plan Update 2015 is to validate and update the framework of development proposed in the 2009 Master Plan.

The RML Master Plan Update seeks to create and maintain a campus environment conducive to accomplishing the NIH, NIAID and RML missions while providing a physical framework for the changing character, nature and priority of RML's biomedical research programs. It provides a long-range planning envelope for the RML campus, and outlines a strategy for accommodating potential campus development subject to future NIH priorities and the availability of resources. It identifies the physical opportunities and limitations of the campus and projects future staff population and associated facilities for planning purposes. It recognizes, however, that actual program realization at any given time will depend on NIH and HHS priorities, congressional and presidential policy decisions and federal budgetary realities. Although the proposed projects may not be required or carried out to the extent shown in this plan, the Master Plan will help ensure orderly future development of the campus if and as it occurs.

Furthermore, while the Master Plan is a reasonable guideline for future development it does not represent the pre-approval of any individual facilities project nor the particular needs of specific programs to be accommodated on the campus since the financing of such projects and programs must be addressed within the annual HHS budget processes and the HHS Capital Investment Review Board mechanisms.

In accordance with the National Environmental Policy Act of 1969, as amended, (NEPA), federal agencies must use a systematic, interdisciplinary approach that will ensure the integrated use of the natural and social sciences in planning and decision-making activities that may have an impact on the human environment. An environmental document, in this case the Environmental Assessment (EA) which has been prepared to accompany this NIH 2015 RML Master Plan Update 2015, satisfies this requirement.

The NIH RML Master Plan 2015 Update builds upon the 2009 RMP Master Plan and other recent studies of the RML campus. It updates the programmatic basis and integrates campus-wide planning with current physical security requirements. It is recognized that the Master Plan is a work in progress, for a “living campus”, and the NIH intends to continue to update the plan periodically.

Related planning studies used as a basis of this document include:

- Site Utilization Study: A Site Utilization Study, conducted by Architects Design Group (ADG) of Kalispell, Montana, was completed in 2002 which summarized data collected about the program needs, the regional setting, existing natural resources, and infrastructure. The RML master planning process used this and other information to identify campus needs and develop recommendations and standards for future site development.
- Campus Development Guidelines for RML: In June 2005, NIH, with the assistance of RTKL Associates, Inc., developed Campus Development Guidelines for RML. The Guidelines are general standards which, when applied to new RML development projects, produce an organized and unified campus environment intended to provide guidelines to promote a sympathetic and visually appealing campus appearance respectful of campus needs as well as the character of the surrounding community. The fundamental elements of the campus are described in the report including its history, the overall campus layout, the distinct neighborhoods within the campus, and site landscaping patterns. These proposed design

guidelines further specify provisions for setbacks, parking locations, and acceptable ranges of exterior building materials.

- 2009 RML Master Plan: The 2009 RML Master Plan, with accompanying NEPA documentation, built upon these previous studies. It updated the programmatic basis and integrated campus-wide planning with current physical security requirements. This Master Plan was been developed for a 20-year planning horizon, and personnel and space estimates were arranged in four incremental phases covering the 20-year period.
- 2014 Rocky Mounty Laboratory Physical Security and Space Needs Assessment: In January 2014, NIAID released the draft Rocky Mounty Laboratory Physical Security and Space Needs Assessment. The design team of Dewberry, Hinman, and Perkins+Will was commissioned to complete a space assessment and security assessment of the campus. The space assessment focused on NIAID's space with an evaluation of existing space, the efficiency and appropriateness of use, general conditions of existing space, and security needs.

The Missions of the NIH, NIAID, and RML

The National Institutes of Health

The NIH is the federal government's focal point for health research and one of the world's foremost biomedical research institutions.

The mission of the NIH is to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability. The goals of the NIH are:

- to foster fundamental creative discoveries, innovative research strategies, and their applications as a basis for ultimately protecting and improving health;
- to develop, maintain, and renew scientific human and physical resources that will ensure the Nation's capability to prevent disease;
- to expand the knowledge base in medical and associated sciences in order to enhance the Nation's economic well-being and ensure a continued high return on the public investment in research; and
- to exemplify and promote the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science. (National Institutes of Health, 2013)

National Institute of Allergy and Infectious Diseases

The NIAID conducts and supports basic and applied research to better understand, treat, and ultimately prevent infectious, immunologic, and allergic diseases. For more than 50 years, NIAID research has led to new therapies, vaccines, diagnostic tests, and other technologies that have improved the health of millions of people in the United States and around the world.

Scientists in NIAID's Division of Intramural Research (DIR), of which RML is a part, conduct laboratory and clinical research covering a wide range of biomedical disciplines related to infectious diseases, immunology, and allergy. Much of the research in DIR involves investigation of the multitude of interacting cells, antibodies, receptors, proteins, and chemicals that compose the immune system.

Rocky Mountain Laboratories

The RML Mission Statement is to provide biomedical research serving humanity. Scientists in these laboratories conduct basic and applied research in immunology, allergy, and infectious diseases and related clinical disorders. The research done on this campus plays a leading role in the nation's effort to develop diagnostics, vaccines, and therapeutics to combat emerging and re-emerging infectious diseases. The strength of RML programs is in vector-borne transmission of infectious diseases and prion disease research.

RML's most significant contributions to the NIAID intramural research program are its unique scientific programs which conduct research in highly infectious emerging infectious disease such as Transmissible Spongiform Encephalopathy, Lyme Disease, Bubonic Plague, Q Fever, Chlamydia, and other highly infectious emerging infectious disease. RML serves as a lead resource for the NIH response to public health emergencies illustrated by the recent outbreaks of emerging viral diseases such as MERS and Ebola virus. RML's mission also includes biomedical research regarding the diagnostics, vaccines, immunotherapies, drugs, and biologics to prevent and cure diseases associated with the intentional release of agents into civilian populations. To support this mission the RML campus contains secure laboratory facilities and support services.

Planning Methodology

Functional and personnel needs over the next 10 years were projected by NIAID and ORF as part of the 2013 Building and Space Plan meetings that the Division of Facilities Planning conducts on an annual basis. Participants agreed that the 2009 RML Master Plan is still applicable. Recent projects, that were in the master plan and have now been constructed, must be added to the NIH

RML Master Plan Update 2015. Existing conditions and several new considerations must be incorporated.

Program Needs

The following Program Needs have been identified by NIAID Leadership, and staff from NIAID, ORF, and ORS. This information was gathered through the Building and Space Plan Meetings, the 2013 NIAID Space Needs Assessment, and subsequent interviews.

- **BSL-2 and BSL-3 laboratories:** Currently the BSL-2 and BSL-3 labs are fully occupied and utilized. The research mission of expanding emerging infectious diseases research dictates that additional BSL-3 space with accompanying BSL-2 support space is needed. Some studies (i.e. pandemic flu) cannot be completed in the current (A)BSL-3 labs and vivarium because there is no provision for shower-out as required by the Biosafety in Microbiological and Biomedical Laboratories (BMBL). Furthermore, the absence of sufficient (A)BSL-3 space is requiring (A)BSL-4 space to be used for (A)BSL-3 studies, which may under-utilize the critical (A)BSL-4 facility. The lack of (A)BSL-3 space is particularly limiting for the NIH response to infectious disease outbreaks. In fact, this condition requires frequent utilization of the (A)BSL-4 space in the Building 28 IRF for BSL-3 agents. The project justification documents for Building G call for approximately 16,200 NASF of BSL-2 labs, 6,100 NASF of BSL-3 labs, and 5,200 NASF of vivarium space to meet this program need.
- **Conference and Collaboration Space:** Large auditorium with capacity to accommodate RML staff as well as small conference rooms and collaboration spaces
- **Archival storage:** Long term storage for biological study samples.

The following needs have been identified by the Office of Research Facilities (ORF) and the Office of Research Services (ORS) Staff:

- **Replace functionally unsuitable buildings**: Many service and storage functions are housed in trailers and containers. These are not temporary functions and therefore should be housed in permanent facilities for efficiency and safety. Programs that require permanent facilities include the service and storage functions in the HD and SS buildings.

- **Service and Support Facility:** A consolidated facility for current and future maintenance personnel as well as the NIH Police and the Division of Occupational Health and Safety (DOHS).

- **Waste Storage facility:** A marshalling facility for items RML intends to hold for a short period of time before they would be removed from campus by individuals or private contractors. These items would include recycled waste, general waste, and surplus equipment awaiting donation or removal from campus. An outside storage yard should contain closed compacting-type dumpsters for trash and recycled waste. The yard should be screened from off-site views.

- **General storage:** There is a need for more space to store cages, racks, bedding, and feed in the veterinary branch; supplies and other materials; documents and other items.
- **Vehicle storage:** Hazardous Material Response truck garage for two existing vehicles
- **Increased utility capacity:** New laboratory, animal facility and computational research functions would place a higher load on the existing utilities (chilled water, power, and IT connectivity). The campus utilities would need to be augmented to accommodate this added demand.

Program Basis

In order to develop a framework for this Master Plan, a projection of functional, personnel, and space needs was prepared.

The 2014 total population on the RML campus is 372. Total estimated population at the end of the 20-year planning period is projected to be 511. The primary growth at the campus is anticipated to be through expanded initiatives in existing research programs and associated supporting services. Over the planning period, the number of RML personnel is projected to change as indicated in the following table:

Baseline (2014)	Phase 1	Phase 2	Phase 3	Phase 4
372	382	475	497	511

This Master Plan is based, as well, on a number of planning premises and principles, chief among them is accommodating the anticipated scientific needs of RML's biomedical research programs. The Master Plan identifies current and future impacts on building areas, parking and transportation systems, and utilities infrastructure. At the same time, the capacity of the campus for accommodating occupied space was tempered based on broader community and campus planning goals and objectives.

The Master Plan provides a strategy for accommodating the space needs related to these personnel projections, while at the same time satisfying other campus goals and objectives, including decompression of overcrowded office and laboratory space, utility upgrades, and the addition of necessary amenities. It is estimated that the space on the RML campus will grow from approximately

363,266 to nearly 506,126 gross square feet, an increase of about 142,860 gross square feet of building area. Most of this growth will be in construction of new research and animal facilities.

Master Plan Goals

The basic goals of the Master Plan are:

- **Goal 1:** Provide a flexible framework for a "living campus", one that can adapt to the needs of current and future NIAID and National Institute of Health programs in support of the scientific mission of the National Institutes of Health should resources become available.
- **Goal 2**: Provide an attractive campus whose setting and composition promote collegial interaction and opportunities for informal and formal collaboration and exchange of ideas, expertise and data.
- **Goal 3:** Provide a secure, supportive, and convenient work environment for the people involved in RML activities, including scientists and professional administrative staff, visitors, and other non-RML users, with amenities that enhance the quality of life for staff.
- **Goal 4:** Enhance the appearance of the RML campus so that it complements the surrounding residential community.
- **Goal 5:** Protect, conserve and enhance RML's natural, historic, and scenic resources.
- **Goal 6:** Foster improved communication about, and better understanding of, NIH goals and policies through the planning process.
- **Goal 7:** Meet the Federal Real Property Council's Performance Measures.

Master Development Plan Update

Current Status of Projects

Phase 1 of the 2009 Master Plan is nearly complete and a few of the projects in phase 2 are complete or in the planning phase as listed in Exhibit 0-2 and depicted in Exhibit 0-1. Several Projects that were not described in the 2009 Master Plan have also been completed. They include:

1. Building 23 Incinerator Scrubber Expansion
2. Building 7 Renovation
3. Dedicated Electrical feeder
4. Security Control Center Consolidation in Building 31

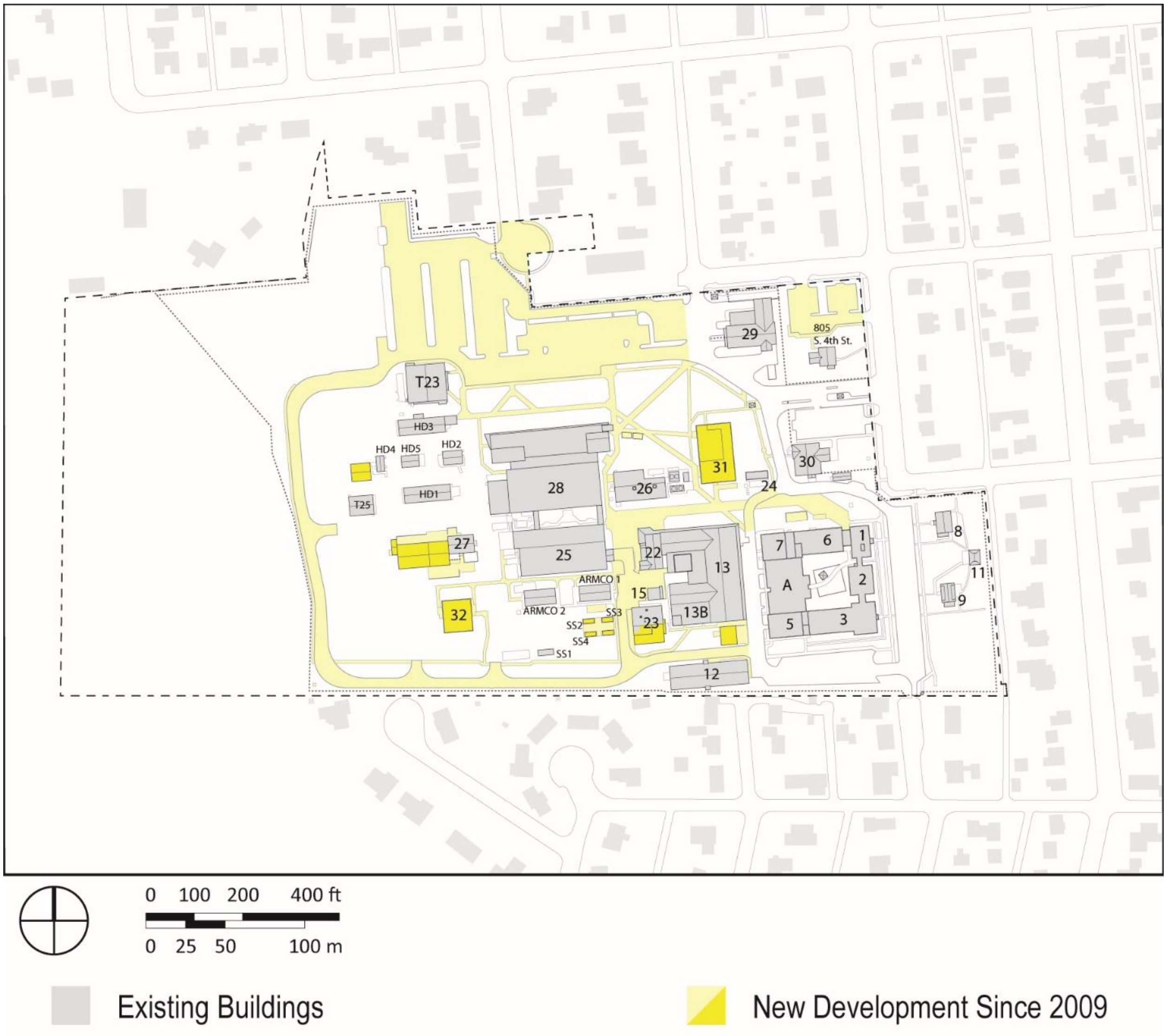

Exhibit 0-1: New Development Since 2009

Exhibit 0-2: Current Status of 2009 Master Plan Projects

2009 Master Plan	Action	Use	Demolished (GSF)	Constructed (GSF)
Phase 1	Construct Building 31	Administrative		29,695
Phase 1	Construct Building 32	Animal Facility		4,020
Phase 1	Demolish Building 14	Storage	4,000	
Phase 1	Demolish Building 16	Research Support	3,520	
Phase 1	Demolish Building 17	Storage	2,975	
Phase 1	Demolish Building 21	Equipment Storage	2,843	
Phase 1	Site Improvements	Purchase North and Northeast property		
Phase 1	Site Improvements	Construct Loop Road		
Phase 1	Site Improvements	Parking		
Phase 1	Site Improvements	Security Fence around the new north property		
Phase 1	Site Improvements	Demolish duplex house on new northeast property		
Phase 1	Site Improvements	Construct Parking on northeast property		
Phase 2	Construct Building F	Central Generator Plant Addition		5,657
		Total GSF Change	13,338	39,372

Currently, the projects in construction, design, and planning are:

- Construction: Generator Expansion and Centralization project (Building F), as shown in the 2009 Master Plan, is under construction.
- Design: Modification to the new Building 31 to house a new Computational Research Center (CCR) to be funded by NIAID. Demand for on-site data processing and storage has grown exponentially in the last several years. This project will address

the current demand. The design is proceeding. In order to accommodate the CCR, functions located in Building 31 will be relocated to Buildings 8, 9, and 12.

- Planning: The Program of Requirements (POR) and schematic design for a new Maintenance Facility (Buildings C) has been completed. This project is not currently funded.
- Planning: The POR for a new Laboratory (Building G) and schematic design has been completed. This project is not currently funded.
- Study: The Rocky Mounty Laboratory Physical Security and Space Needs Assessment proposed that Buildings 8, 9, and 12 be renovated to comply with security requirements. NIAID would like to use these buildings for administrative functions. The Office of Research Facilities is working with the Division of Physical Security and the State Historic Preservation Office to propose renovations to Building 8 and 9 that will allow administrative functions to be housed in the buildings. These projects are in development.

Description of the Master Plan Concept

The Master Plan builds on the existing campus and buildings, defers in scale to the neighboring residential neighborhoods, and respects the historic areas within and adjacent to the campus.

Functional Relationships

The primary concept underlying the functional relationships in the Master Plan is the idea of locating the research laboratories in close proximity to animal facilities and the animal facilities immediately adjacent to each other. In turn, these central laboratory/animal facilities would be flanked on the north by administrative and supply support and on the west by the maintenance complex. Administrative and central supply functions would be consolidated centrally to the uses they serve promoting more effective utilization of space resources. Utility functions would remain in their current locations for efficient utility distribution. Maintenance and Operations facilities would be consolidated in the southwest corner of the site away from staff and visitor traffic. The historic laboratory quadrangle would remain intact and continue as the central showcase of the campus.

Open Space

A 100' wide open space buffer zone would be maintained along the site perimeter serving dually as a visual buffer as well as a security standoff to mitigate effects of any possible blast originating on the border of the site. This space would be landscaped to be attractive from the neighbors' perspective while preserving needed views for surveillance. The NIH RML Master Plan 2015 Update proposes to maintain surface parking at the perimeter but no new structures within this buffer zone.

In the interior of the campus is a Central Pedestrian Concourse with connections from the Quad and administrative support center to Buildings 13, 25, and the IRF. This concept is well-suited for creating a "campus" atmosphere with spaces and opportunities for interaction via more informal, random encounters of staff.

Building Patterns

All new development would follow the orthogonal grid established by existing buildings. This pattern would be continued and reinforced with the placement of new buildings. Advantages of developing the campus on a grid system include ease of integration with existing orthogonally oriented structures, efficiency of land use, economical integration with, and extension of, the utility distribution system.

Massing and Heights

The primary concept for building massing on the RML campus is concentrating the tallest structures along the central axis of the campus, with a transition in height to lower buildings toward the perimeter.

Circulation

The vehicular circulation concept for the campus provides a loop road at the campus perimeter as well as a loop around the Quad to access parking in this area. The Master Plan would retain the two existing entries to the campus, the staff and visitor entrance from 4^{th} and Grove Streets and the delivery/contractor service entrance from 5^{th} and Baker Streets. Two new emergency exits are provided; one from the north parking lot to 6^{th} Street, and the other from the south parking lot to 4^{th} street, south of campus.

Built Environment

Exhibit 0-3 describes the plans for the existing buildings on the RML campus.

Exhibit 0-3 : Existing Building Disposition in NIH RML Master Plan Update 2015

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
RML 01	The Laboratory Quad	Laboratory, Director's Reserve and Shared Laboratory Support	8,246	Renovate the Quad to increase Utilization Rate and modernize meeting and conferencing spaces and house the Visual Medical Arts Branch
RML A	The Quad Support	Utility and mechanical space and Shared Laboratory Support	24,929	
RML 02	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	9,468	
RML 03	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	2,4814	
RML 05	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	7,224	
RML 06	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	15,000	
RML 07	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	3,975	
RML 08	Limited Use due to security concerns	Vacant	4,461	Renovate Building 8 to address security concerns. To be used for Administrative space.
RML 09	Limited Use due to security concerns	Vacant	3,156	Renovate Building 9 to address security concerns. To be used for Administrative space.
RML 11	Contract Support Services due to	Administrative Services	660	Retain

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
	security concerns			
RML 12	Freezer Storage, Medical Arts	Shared Laboratory Support	7,690	Relocate Visual Medical Arts into Building 1. Relocate remaining functions to proposed buildings D and J. Raze Building 12.
RML 13	Animal	Veterinary Branch	17,800	Retain
RML 13B	Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	5,880	Retain
RML 15	Radiological Storage	Equipment Storage	1,092	Retain
RML 22	Waste Marshalling/ Recycling Facility	Shipping and Receiving	2,624	Relocate shipping and Receiving function to Building D and renovate Building 22 for facility support functions.
RML 23	Incinerator with scrubber	Central plant	4,712	Retain
RML 24	CCR Emergency Generator	Central plant	700	Retain
RML 25	High Containment Lab	Laboratory, Director's Reserve, Vivarium and Shared Laboratory Support	33,901	Retain
RML 26	Central Boiler Plant	Central plant	5,664	Retain
RML 27	Emergency Generator	Central plant	1,961	Retain
RML 28	High Containment Lab	Laboratory, Director's Reserve, Vivarium and Shared Laboratory Support	111,590	Retain
RML 29	Shipping and Receiving	Shipping and Receiving	7,525	Retain

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
RML 30	Visitor's Center	Visitor's Center	3,562	Retain
RML 31	Admin and Computational Center	Administrative Services	29,695	Renovate a portion of Building 31 to house the RML Computational Center.
RML 32	Vivarium	Veterinary Branch	4,020	Retain
RML ARMCO-1		Veterinary Branch	2,048	Relocate functions to the proposed Building C and raze RML ARMCO-1
RML ARMCO-2	Vivarium	Veterinary Branch	2,048	Relocate functions to the proposed Building B and raze RML ARMCO-2
RML HD1		Maintenance Shops and Storage	3,072	Relocate functions to the proposed Building C and raze HD 1-5
RML HD2		Maintenance Shops and Storage	1,120	
RML HD3		Maintenance Shops and Storage	3,482	
RML HD4		Maintenance Shops and Storage	512	Relocate functions to the proposed Building C and raze HD 1-5
RML HD5		Maintenance Shops and Storage	864	
RML SS1		Chemical and Hazardous Material Storage	476	Relocate functions to the proposed Building C and raze SS 1-4
RML SS2		Chemical and Hazardous Material Storage	476	
RML SS3		Chemical and Hazardous Material Storage	476	
RML SS4		Chemical and Hazardous Material Storage	476	
RML T23		ORF and ORS Police Offices	4,908	Relocate functions to the proposed

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
				Building C and raze T23
RML T25		Equipment Storage	2,000	Relocate functions to the proposed Building C and raze T25
805 South 4th St.		Vacant	1,867	Maintain historic structure
CONEX 1		Equipment Storage	1,448	Relocate functions to the proposed Building C and raze CONEX 1

The NIH RML Master Plan 2015 Update, shown in Exhibit 0-4, is the vision for future development on the RML campus. It would accommodate a potential campus employee population growth of 139 (40% growth) over the 20-year timeframe of the plan, from 372 currently to approximately 511. To support the growth in number of employees, and related utility upgrades, the campus gross built area could potentially increase during the Master Plan period from 363,266 GSF to 506,126 GSF which includes the replacement of approximately 26,330 GSF of obsolete buildings to be demolished. Much of the building area growth would be attributable to construction of a central administrative building for campus-wide, shared meeting spaces (Building J); a computational laboratory building (Building H); expanded animal care facilities south of Building 25 (Building B and Building L); construction of a new research laboratory building west of Building 28 (Building G); and consolidation of maintenance activities in the southwest corner of the buildable site area (Building C). Solid Waste Management Facilities and Government Vehicle Storage would be constructed just inside the service entrance (Building D). An Interpretive Center would be built to the west of 805 South 4th Street. In the future, prior to construction of Building G, a chilled water plant expansion will be needed at building 28.

Existing parking at the south perimeter and within the historic core has been improved and would be retained, and new surface parking has been put in place along the north perimeter within an expanded site created by the 2010 land acquisition of property on the northeast corner of the site.

Recent land acquisition included an existing log home (805 South 4th Street) which provides a site for a public information facility, to be called the Interpretive Center, located outside of the protected site perimeter and with its own access and parking. In the 2009 RML Master Plan, NIH intended to renovate the historic log home to be the new Interpretive Center. While NIH still plans for the construction of an Interpretive Center, a renovation of the log home, which maintains its historic integrity and but would create challenges to meet building safety standard for public use may not be the most efficient use of funds. The NIH RML Master Plan Update 2015 recommends that a study be conducted to compare renovation of the existing log home versus new construction of an interpretive center to determine which option is preferred.

B RMVB Expansion Vivarium
C Maintenance Complex
D Waste Marshalling and Vehicle Storage Facility
G Laboratory
H Laboratory
J Administrative Building
K Interpretive Center

- - - - - - - Property Line
Security Fence
New Building

Exhibit 0-4: Illustrative 20 Year NIH RML Master Plan Update 2015

Table of Contents

List of Exhibits

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1 INTRODUCTION AND PROGRAM REQUIREMENTS

1.1 INTRODUCTION

The National Institutes of Health (NIH) is the focal point of the federal government for health research and one of the world's foremost biomedical research institutions. Its mission is to discover new knowledge that will lead to better health for all. To achieve that mission, the NIH invests nearly $30.1 billion annually in medical research for the American people.

More than 80% of NIH's funding is spread across almost 50,000 competitive grants awarded to more than 300,000 researchers at over 2,500 universities, medical schools, and other research institutions in every US state and around the world. About 10% of the NIH's budget supports projects conducted by nearly 6,000 scientists in its own laboratories on the Bethesda campus and at other NIH Intramural facilities including the Rocky Mountain Laboratories (RML).

Research is conducted at both the basic and clinical levels, encompassing studies related to the prevention, diagnosis, treatment, and cure of diseases that afflict men, women, and children around the world. In addition, the basic research supported by NIH provides the foundation for the nation's pharmaceutical and biotechnology industries. As one measure of the agency's excellence in research, to date, 144 NIH supported researchers have been sole or shared recipients of 85 Nobel Prizes (between 1939 and 2015). (NIH Almanac , 2014)

1.2 PURPOSE AND SCOPE OF THE NIH RML CAMPUS MASTER PLAN UPDATE

The purpose of this Master Plan is to define the real property assets that would support the execution of the programs housed at the NIH RML Campus and to guide new development within the campus, in support of the mission of the National Institutes of Health. Realization of the Master Plan at any given time will depend on HHS and NIH priorities, governmental policy decisions, as well as budgetary considerations. The Master Plan does not represent the pre-approval of any individual facilities project or the pre-approval of the particular needs of specific programs to be accommodated on the campus. The Master Plan is, therefore, designed as a flexible framework and a guide for the orderly future development of the campus, if and as it occurs.

The first comprehensive master plan for RML was developed in 2009, with 2005 serving as the baseline condition. At the time, construction of the new Integrated Research Facility (IRF), physical security requirements, growing concerns in the Hamilton area about campus development and effects on natural resources, as well as increased interest within the local community about activities on the RML campus had made clear the need for a coordinated plan for future development of the site. The 2009 Master Plan, upon which this update is based, was prepared by Oudens + Knoop Architects PC, a subcontractor to LSY Architects under a contract with the NIH in collaboration with the Division of Facilities Planning (DFP), and with the leadership at NIAID and RML. The Purpose of this Master Plan is to validate and update the framework of development proposed in the 2009 Master Plan.

The objective of this Master Plan is to provide a guide for the reasoned and orderly development of the RML campus, one that values and builds on existing resources, corrects current deficiencies and meets changing needs through new construction or renovation. The plan sets forth implementation priorities and a logical sequencing of planned development.

The Master Plan Update is not intended to be a specific design and construction program, but rather a framework within which design and construction can occur for actual projects over the next 20 years as the programmatic needs upon which the plan is based arise. It does not attempt to anticipate budgets or congressional and presidential priorities and mandates. The objective has been to base the Master Plan solely on the NIH’s best forecast of where the science is going on the premise that the more inclusive the plan, the more receptive it will be to a variety of future development possibilities. The Master Plan Update does not represent the pre-approval of any individual facilities project nor the particular needs of specific programs to be accommodated on the campus since the financing of such programs must be addressed within the annual Department of Health and Human Services (HHS) budget processes and the HHS Capital Investment Review Board mechanisms.

1.3 ROLES AND RESPONSIBILITIES

1.3.1 HHS Facility Capital Investment Review Board

The Health and Human Services (HHS) Facility Capital Investment Review Board (“the Board,” or CIRB) was established on June 9, 2003 to make recommendations for strategic management of HHS real property assets and to advise the Secretary, the Assistant Secretary for Administration (ASA) and the Senior Real Property Officer (SRPO) on major facility capital investment issues. The Board also advises, assists, consults with, and makes recommendations to the ASA, the Secretary, and, when appropriate, the Assistant Secretary for Financial Resources (ASFR), regarding the broad range of responsibilities.

The ASA has delegated oversight authority and provides direction to all HHS Operating Divisions (OPDIVs) with facility acquisition and operation responsibilities and land acquisition authority. OMB Circular A-11, Part 7 identifies a formal capital asset management infrastructure as a best practice. It further states that "An Executive Review Committee, acting for or with the Agency Head, should be responsible for reviewing the agency's entire capital asset portfolio on a periodic basis and making decisions on the proper composition of agency assets needed to achieve strategic goals and objectives within budget limits." This Board implements the responsibilities assigned to the "Executive Review Committee."

The Board provides advice and makes recommendations to the Secretary, the ASAM, the SRPO, and the ASFR on a range of issues, including: 1) the development of facility capital investment guidelines; 2) the development of guidelines to implement an investment review process that provides strategic planning for and oversight and guidance of facility investments; and 3) regular monitoring and proper management of these investments, once funded. One of the outputs of the investment review process is a regular update of HHS' investment portfolio or plan that supports HHS strategic objectives.

1.3.2 The NIH Director

The NIH Director, with a unique and critical perspective on the entire agency, is responsible for providing leadership to the Institutes and for identifying needs and opportunities, especially for efforts that involve multiple Institutes. The NIH Director approves NIH Master Plans.

1.3.3 The NIH Steering Committee

The NIH Steering Committee, established in 2002, is the NIH's overall, non-scientific governing board, composed of ten Institute Center (IC) directors, one chairman (the Director of the NIH) and an ex –officio member. The three largest funded institutes —the National Cancer Institute (NCI), the National Institute of Allergy and Infectious Disease (NIAID), and the National Heart, Lung and Blood Institute (NHLBI) —are permanent members; the other slots rotate in staggered 3-year terms. Among the remaining ICs, staff from the Senior Office of the Director also participates by serving on topic-specific fact-finding subcommittee work groups.

1.3.4 The NIH Facilities Working Group

The Facilities Working Group (FWG) is comprised of ten voting members plus one non-voting member. It includes representation of various IC Directors, Scientific Directors and Executive Officers. The FWG advises the NIH Steering Committee, the NIH Ics, and the NIH Director on matters pertaining to the planning, acquisition, development, and use of land and facilities for the pursuit of the NIH mission. The FWG is considered as part of the NIH governance structure which strives to interconnect the complexity of space resource allocations in an integrated and equitable manner to support the pluralistic biomedical research focus of the NIH.

The FWG is responsible for evaluating the physical and environmental frameworks defined in NIH master plans and guiding them to best accommodate the NIH research priorities and initiatives. The FWG evaluates the NIH's programmatic needs, balances competing priorities, and explores alternative means of meeting the NIH's changing needs for capital facilities. The FWG's decisions guide the annual update of the five-year Strategic Facilities Plan, Buildings and Facilities (B&F) Plan, and the Leased Facilities Plan.

The FWG provides advice to the Director of the NIH Office of Research Facilities Development and Operations (ORF) on operating policies and business strategy.

1.3.4.1 *The Space Recommendations Board*

The Space Recommendation Board (SRB) consists of the Deputy Director for Intramural Research, the Deputy Director for Management, the Director of the Office of Research Facilities Development and Operations, and an IC Director, who is the chairperson of the FWG. The Deputy Director for Intramural Research addresses program issues and prioritizes requests for laboratory and clinical research space for the Intramural Research Programs (IRP). Program issues and priorities for administrative space requests for the ICs and the Office of the Director, including Extramural Research Program (ERP), are addressed by the Deputy Director for Management. The Director of the Office of Research Facilities Development and Operations (ORF) addresses the facility and infrastructure implications and technical feasibility of the requests. The Division of Facilities Planning, ORF, provides staff support to the SRB.

1.3.5 NIH Architectural Design Review Board

The Architectural Design Review Board (ADRB) was established by ORF in 2003 to preserve and enhance the beauty and order of NIH's campuses. This is accomplished by (1) promoting high quality site planning and architectural designs which are in harmony with surrounding uses, both on and off-campus, (2) reviewing facility design proposals for their consistency with the approved campus master plan and its planning principles, and (3) encouraging project designs that are compatible with the existing campus fabric in terms of architectural style and character, massing, color, materials, and the quality of open space. The NIH design review process encourages reviews of facility projects at the earliest design stages. ADRB recommendations are directed at the planning, design, and/or appearance of NIH projects and are advisory to ORF Senior Management which has the final authority to approve, disapprove, or modify the design of a facility project.

1.4 THE NIH ORGANIZATION

The NIH is one of eight health agencies in the U.S. Public Health Service (USPHS) which, in turn, is a component of the U.S. Department of Health and Human Services (HHS).

1.4.1 The Office of the Director

The Office of the Director is the central office at the NIH. The OD is responsible for setting policy for the NIH and for planning, managing, and coordinating the programs and activities of all the NIH components. The NIH Director provides overall leadership to NIH activities in both scientific and administrative matters. Although each institute within the NIH has a specialized mission, the NIH Director plays an active role in shaping the agency's research agenda and outlook.

The Office of Management is located within the NIH Office of the Director and has responsibility for management and financial functions of the NIH. The following are descriptions of Office of Management components having greater relevance to the RML Master Plan:

1.4.1.1 *ADMINISTRATION AND SERVICES*

1.4.1.1.1 *Executive Office*

The Executive Office serves in both a staff and operational capacity for all administrative support activities for the Office of the Director, excluding the Office of Research Services.

Office of Research Facilities Development and Operations (ORF)

The Office of Research Facilities supports NIH priorities by providing safe, secure, sound, healthy, and attractive facilities and space.

Division of Facilities, Operations, and Maintenance (DFOM)

The Division of Facilities, Operations, and Maintenance (DFOM) is responsible for the safe, efficient, and effective operation and maintenance of NIH real property. The Rocky Mountain Laboratory Facilities Management Branch (RMLFMB) delivers the facility-related services to the Rocky Mountain Laboratory site including operations, maintenance, design, and construction of facilities.

RMLFMB plans and directs comprehensive facility management program to ensure that occupants and visitors of the NIH facilities enjoy "quiet use" and receive facility based services. The RMLFMB responsibilities include:

- Planning and directing comprehensive predictive, preventive, and emergency maintenance program to ensure the safety and physical security of occupants and the short and long-term physical integrity of the NIH real property assets and the contents therein;
- Advising the NIH management on matters related to the operation, maintenance, and short and long term support of NIH real property assets including sites and site structures, buildings and non-Bethesda plant facilities;
- Developing, tracking and reporting operational performance and financial information used for program assessment;
- Providing support to the NIH ICs in connection with their day-to-day facility needs;
- Collaborating, coordinating, planning, and directing the execution in support of all programs under the responsibility of the Office of Research Facilities as the daily on the ground interface and first line of communication for all customer interfaces; and
- Ensuring facilities operations and maintenance performance meets accreditation standards of the Association for Assessment and Accreditation of Laboratory Animal Care, the Centers for Disease Control, the Occupational Safety and Health Administration, and other independent reviews.

Division of Facilities Planning (DFP)

The Division of Facilities Planning (DFP) proactively provides NIH Leadership, Institutes, and Centers with reliable, impartial, and informed site master plans and strategic facility and environmental planning services, and facilitates space utilization decisions to support the timely delivery of owned and leased facilities to meet the NIH's research mission.

DFP provides this through short-, mid-, and long-range planning for all NIH sites and facilities; develops and oversees the implementation of the site master plans; develops the NIH Buildings and Space Plan and the Buildings & Facilities budget plan; administers the space request process:

collects and maintains the NIH census; provides expertise in transportation and environmental planning; oversees activities that impact the use, appearance and environmental quality of NIH controlled sites; and provides technical liaison with other agencies and community organizations.

Division of Environmental Protection (DEP)

DEP works to protect and enhance the NIH environment. In addition to an Office of the Director, DEP includes three branches:

- The Sustainability Branch which is responsible for the supervision, management, and conduct of the environmental quality program at NIH, providing professional, engineering and architectural services to analyze and audit environmental impacts and ensure sound environmental planning principles, including material and energy conservation.
- The Environmental Compliance Branch serves as the focal point for regulatory inspections and required environmental permits and plans. Branch employees provide services to support facilities and research operations by knowing and understanding the applicable regulations, disseminating information on how these regulatory obligations can be met, and working with NIH staff to minimize noncompliance.
- The Waste and Resource Recovery Branch is responsible for the supervision, management, and conduct of the waste management program at NIH, providing professional and technical support in the collection, transport, treatment, recycling, and disposal of the hazardous and non-hazardous chemical, medical pathological, general, and solid and mixed wastes

Office of Research Services (ORS)

Provides laboratory safety, radiation safety, and occupational medical services, police, fire protection, and emergency planning services, veterinary resources, library services, events management assistance, travel and transportation support, services for foreign scientists, and programs to enrich and enhance the NIH worksite.

1.4.1.2 *Program Coordination*

The 21 NIH Institutes (ICs) and six NIH Centers, all of which either conduct or support scientific research, are managed and coordinated by the Office of the Director, NIH. The NIH Institutes are:

- National Cancer Institute
- National Eye Institute
- National Heart, Lung, and Blood Institute
- National Human Genome Research Institute

- National Institute on Aging
- National Institute on Alcohol Abuse and Alcoholism
- National Institute of Allergy and Infectious Diseases (NIAID)
- National Institute of Arthritis and Musculoskeletal and Skin Diseases
- National Institute of Biomedical Imaging and Bioengineering
- Eunice Kennedy Shriver National Institute of Child Health and Human Development
- National Institute on Deafness and Other Communication Disorders
- National Institute of Dental and Craniofacial Research
- National Institute of Diabetes and Digestive and Kidney Diseases
- National Institute on Drug Abuse
- National Institute of Environmental Health Sciences
- National Institute of General Medical Sciences
- National Institute of Mental Health
- National Institute on Minority Health and Health Disparities
- National Institute of Neurological Disorders and Stroke
- National Institute of Nursing Research
- National Library of Medicine

The NIH Centers are:

- Center for Information Technology
- Center for Scientific Review
- John E. Fogarty International Center for Advanced Study in the Health Sciences
- National Center for Complementary and Integrative Health
- National Center for Advancing Translational Sciences
- NIH Clinical Center

1.4.2 NIAID

At the time of this document, the National Institute of Allergy and Infectious Diseases (NIAID) Division of Intramural Research is the primary occupant of the NIH RML campus.

NIAID conducts and supports basic and applied research to better understand, treat, and ultimately prevent infectious, immunologic, and allergic diseases. For more than 60 years, NIAID research has led to new therapies, vaccines, diagnostic tests, and other technologies that have improved the health of millions of people in the United States and around the world.

1.4.2.1 *NIAID Organization*

Office of the Director

The Office of the Director (OD) provides scientific leadership, policy guidance, and overall operational and administrative coordination for the Institute to support its scientific mission for both intramural federal science programs and extramural scientific grantees. The OD oversees budget and financial planning, strategic planning and evaluation, program development, communications and legislative affairs, workforce development, technology transfer, cyber infrastructure, ethics, workplace services and global research coordination.

NIAID OD serves as the chief liaison with the director of the National Institutes of Health (NIH), other components of the U.S. Department of Health and Human Services, other federal agencies, Congress, professional societies, voluntary health organizations, academic partners and grantees, and additional public health groups. It also coordinates the activities of NIAID extramural and intramural divisions.

Extramural Divisions

Most of the NIAID budget supports research at academic and research institutions outside the Institute (referred to as extramural research) through grants, contracts, and cooperative agreements. Three research divisions at NIAID direct and manage the extramural research portfolio:

Division of Acquired Immunodeficiency Syndrome (DAIDS)

Division of Allergy, Immunology, and Transplantation (DAIT)

Division of Microbiology and Infectious Diseases (DMID)

A fourth extramural division, the Division of Extramural Activities (DEA), oversees policy and management activities related to funding grants and contracts, manages the NIAID research training program, and conducts initial peer review for grants and contracts that address an Institute-specific need or focus.

Intramural Divisions

Three NIAID research divisions conduct studies and clinical investigations within NIAID laboratories (known as intramural research):

- Division of Clinical Research (DCR)
- Division of Intramural Research (DIR)

- Vaccine Research Center (VRC)

The NIAID intramural research program is located on the NIH Campus in Bethesda, Maryland, in leased facilities in Rockville and Frederick, Maryland; and at the NIH Rocky Mountain Laboratories in Hamilton, Montana.

The NIAID DIR scientific programs at RML are organized into five laboratories:

- Laboratory of Human Bacterial Pathogenesis (LHBP)
- Laboratory of Intracellular Parasites (LICP)
- Laboratory of Persistent Viral Diseases (LPVD)
- Laboratory of Virology (LV)
- Laboratory of Zoonotic Pathogens (LZP)

It is anticipated that, at some point in the near future, LICP and LHBP will be officially merged to form the new Laboratory of Bacteriology (LB).

1.5 AUTHORIZATION AND APPLICABILITY

The 2014 NIH Rocky Mountain Laboratories (RML) Master Plan Update and accompanying Environmental Assessment (EA) have been prepared pursuant to the policies contained in Executive Order 13327 Federal Real Property Asset Management and the HHS Facilities Program Manual Volume I, Section 3-1: Facilities Master Planning. The following federal laws, regulations, and Departmental policies are applicable to this NIH RML Master Plan Update:

- HHS Real Property Asset Management Plan (RAMP): The RAMP provides a roadmap for HHS to promote efficient and economical use of federal real property resources that are required to support the Department's missions and strategic goals. It addresses the Department's strategy for implementing these goals through real property management improvement initiatives and strategic planning. The plan also documents how HHS ensures maximum use of its portfolio and identifies those who are accountable for maintaining excellence in real property management.
- National Environmental Policy Act: National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321et seq.) This law prescribes the consideration that federal agencies must give the impact of their actions on the human environment.
- The Clean Air Act: The Clean Air Act of 1970 (42 USC 7401 et seq.). This Act authorizes EPA to establish national standards for air quality to protect the public health and welfare. It

is a comprehensive and complex Federal statue for the prevention and control of air pollution from stationary and mobile sources.

- Clean Air Act Amendments of 1990: Clean Air Act Amendments of 1990 (Pub. L. 101-549, 42 USC 7401-7671q). The amendments accelerate the schedule for pollutant emission reductions from mobile and stationary sources, and set many new requirements for reduction of air toxins by 75%, including reduction of sulfur dioxide emissions, phase out of chlorofluorocarbons, and use of cleaner fuels.
- Clean Water Act: Clean Water Act of 1977, as amended (33 USC 403 et seq., 33 USC 1344 et seq., 33 USC 1413 et seq.).
- The Safe Drinking Water Act: The Safe Drinking Water Act (42 USC 300f-300j-26) authorizes the US EPA to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water.
- National Historic Preservation Act: National Historic Preservation Act of 1966 (and as amended through 2006). This act requires evaluation of the effects that proposed actions will have on historic properties listed or that may be eligible for listing in the National Register of Historic Places. It requires that the Advisory Council on Historic Preservation be notified and given reasonable opportunity to comment with regard to the undertaking.
- Uniform Relocation Assistance and Land Acquisition Policies Act of 1970 (42 USC 4601-4655): Sets forth the policy for fair and equitable treatment of persons displaced as a result of Federal and federally assisted programs.
- Energy Independence & Security Act of 2007 (EISA 2007): Establishes energy management goals and requirements while also amending portions of the National Energy Conservation Policy Act (NECPA). It was signed into law on December 19, 2007.
- Executive Order 11988, “Floodplain Management” prohibits construction or support of incompatible development in floodplains without determining flooding risks, identifying natural floodplain values and impacts, and mitigating those impacts.
- Executive Order 13327, “Federal Real Property Asset Management”, signed February 4, 2004.
- Executive Order 13653, “Preparing the United States for the Impacts of Climate Change”, signed November 1, 2013.
- Executive Order 13690**, “**Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input”, signed January 30, 2015.
- Executive Order 13693, “Planning for Federal Sustainability in the Next Decade”, signed March 19, 2015.

- Comprehensive Environmental Response, Compensation & Liability Act: 42 U.S.C. Section 9601 et seq. Compensation and Liability Act (CERCLA) impose liability for the costs of cleanup on current and former land owners and operators on the land, wherever or whenever there was or is a release or threatened release of a hazardous substance.
- HHS Strategic Sustainability Performance Plan: Sustainability is integral to the HHS mission, which is to protect the health of all Americans and provide essential human services, especially to those who are least able to help themselves. Sustainability has been defined as “the enduring prosperity of all living things.” By this measure, sustainability is directly linked to the health of humans, the health of the environment, and the health of economic systems that support and promote our well-being. This triple health bottom line – human health, environmental health and economic health– is integral to HHS’s mission and the sustainability mandates of Executive Order (EO) 13514.
- HHS Climate Change Adaptation Plan: Prepared in response to E.O. 13514, this document outlines the challenges posed by climate change to the HHS mission, programs, and operations, and identifies specific actions in FY 2013 and beyond to better understand and address those challenges.
- HHS Sustainability Building Plan: The HHS Sustainable Buildings Plan (SBP) is a collection of policy, procedures, guidance and tools designed to summarize and record the Department’s program to incorporate sustainable measures into building assets. The SBP supplements the HHS Strategic Sustainability Performance Plan (SSPP), which is now the framework for the Department’s overall sustainability program.
- Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles): All new construction, major renovation, or repair and alteration of Federal buildings must comply with Guiding Principles
- Principles for Sustainable Location Decision: On October 5, 2009, President Obama signed Executive Order (E.O.) 13514, “Federal Leadership in Environmental, Energy and Economic Performance.” The E.O. states that “It is the policy of the United States that Federal agencies shall…design, construct, maintain, and operate high performance sustainable buildings in sustainable locations, and strengthen the vitality and livability of the communities in which Federal facilities are located.” The Executive Order directs agencies to “advance regional and local integrated planning by...participating in regional transportation planning and recognizing existing community transportation infrastructure; ...ensuring that planning for new Federal facilities or new leases includes consideration of sites that are pedestrian friendly, near existing employment centers, and accessible to public transit, and emphasizes existing central cities and (rural) town centers.

1.6 MASTER PLAN FORMAT

The RML Master Plan consists of six chapters:

- Chapter 1 - Introduction and Program Requirements

  This Chapter provides background and organizational information, defines the approach to the Master Plan Update, establishes the planning premises and identifies programmatic requirements in terms of personnel and physical facilities. It discusses the relationships between the RML Master Plan Update and other long-range NIH planning activities. It also places the Master Plan in the context of the federal government-wide focus on enhancing physical security at its facilities.

- Chapter 2 –The Community Context of the RML Campus

  This chapter provides an overview of the regional setting, placing the RML campus in the context of existing and future land use patterns. It discusses the context of Hamilton, the Bitterroot Valley, and Ravalli County. The context reflects the latest NIH statistics and, where available, data from the 2010 Census and other official sources. Important aspects of the utility services, population and economy, cultural assets, and other research facilities are identified.

- Chapter 3 – Existing Conditions on the NIH Rocky Mountain Laboratories Campus

  Information from 2014 forms the baseline on which the campus has been evaluated. The baseline resource analysis determines the major development features on the RML campus. The chapter also identifies natural and man-made elements which affect potential uses, such as physical features of the site, climate, environmental features, existing land use, utilities, historic/archaeological features, amenities, visual quality, and site constraints and opportunities.

- Chapter 4 – NIH Rocky Mountain Laboratories Master Plan

  The fourth chapter outlines the Master Development Plan, including the specific proposals planned for the campus over the next twenty years, concepts and standards for future development, the distribution of land uses, the location of new buildings, the relationships between utilities and new development, provisions for open space, new circulation and parking plans, and implementation priorities and strategies.

While primary emphasis in the plan is placed on clarifying long-range development patterns, short- and mid-range opportunities are also identified. Sufficient refinement is provided to determine the character and significance of these projects.

- Chapter 5 – Development Guidelines

This chapter provides long-range guidelines for the development of building and site projects set forth in the Master Plan.

1.7 HISTORIC OVERVIEW AND BACKGROUND

1.7.1 Early Public Health Initiatives

The origins of the NIH and federal government's involvement in public health issues can be traced to the mid-nineteenth century in America. Today, NIH continues to serve the nation by providing state-of-the-art research and patient care facilities.

Because little was known about medicine or scientific methods in the eighteenth century, the Constitution included no provisions for federal government involvement in public health. Although government provisions were made for Marines and U.S. Navy officers and seamen in 1798-99, the health issues of the general public were largely ignored. From the time the nation was founded through the early nineteenth century, illness was considered to be primarily an individual concern. When epidemics struck communities, local leaders would often form temporary committees to deal with the crises. By the mid-nineteenth century, as immigrants poured into America, slum conditions in major cities were thought to be the cause of many diseases and conditions. Squalid conditions encountered by troops and their effects on the soldiers' health during the Civil War also contributed to what was at the time termed "sanitary science." (1—Victoria A. Harden, Inventing the NIH: Federal Biomedical Research Policy, 1887-1937, Baltimore and London: The Johns Hopkins University Press, 1984, pp. 9-10.)

In 1872, various interested parties formed the American Public Health Association. Members hoped to assist the federal government in establishing a national bureau that would promote knowledge of the most recent advances in sanitary science. Other organizations, such as the American Medical Association, were also promoting a similar idea, citing the need for a central agency that could coordinate public health programs and provide funding and broad dissemination of knowledge.(2— Ibid., p. 11.)

1.7.2 Establishment of the National Institutes of Health

Following a devastating yellow fever epidemic in the Mississippi Valley in 1878, Congress established a National Board of Health, which was the first government institution to award grants for medical research. However, the Board was short-lived, lasting only until 1883, when its appropriation expired. After a lapse of several years, the Marine Hospital Service (later renamed the Public Health and Marine Hospital Service) established the Hygienic Laboratory in 1887 in Staten Island, New York, with the express purpose of studying bacteriological disorders such as cholera. While the focus of the initial research was on disorders affecting seamen, the Laboratory assumed a large responsibility in 1890 for common ailments among the immigrant population. (3—Ibid, pp. 12-13.)

In 1891, the Hygienic Laboratory needed additional space for research and moved to Washington, D.C., in offices across from the U.S. Capitol. However, in 1895, once again more space was needed and the Laboratory moved to the Old Naval Observatory at 25th and E Streets, NW, a five-acre parcel near the National Mall that provided space to keep research animals. During this time, the Laboratory work focused on infectious diseases because of their powerful threat to public health. This research organization was the very early stages of what eventually became a the National Institute of Allergy and Infectious Diseases (NIAID) after the formulation of the National Institutes of Health (NIH).

In 1912, the governing agency of the Hygienic Laboratory, the Public Health and Marine Hospital Service, was renamed the Public Health Service, indicating that the primary concern of the agency was the public's health and well-being. Throughout World War I, research concentrated on the needs of military troops, but the public benefit of the research was also a goal.

Realizing the importance of the work of the Hygienic Laboratory, Congress passed the Ransdell Act in 1930 which designated the Laboratory as the National Institute of Health (NIH). Authorized to construct research facilities and create a system of research fellowships, the program at the NIH expanded rapidly, and space for conducting experiments as well as additional animal facilities were required.

NIH was given bureau status within the Public Health Service in 1943. Although NIH was still responsible for much of the research relating to infectious diseases, its scope was enlarged to include fundamental medical research into cancers, heart conditions, stroke, and mental illness. (5— J.E. Rall, "Epilogue," in NIH: An Account of Research in Its Laboratories, London: Academic Press, 1984, p. 537.) To reflect the diversity of NIH research, it was renamed the National Institutes (plural) of Health in 1948.

1.7.3 The National Institute of Allergy and Infectious Diseases (NIAID)

The National Institute of Allergy and Infectious Diseases (NIAID) can also trace its origins to the small laboratory at the Marine Hospital in Staten Island, N.Y established in 1887. The laboratory was set up to address cholera and other infectious diseases carried by new U.S. immigrants who arrived during the 1880s.

Dr. Joseph Kinyoun's small Staten Island laboratory, which was known as the Laboratory of Hygiene at the time, was renamed the Hygienic Laboratory in 1891 and moved to Washington, D.C., where Congress authorized it to investigate "infectious and contagious diseases and matters pertaining to the public health." As previously noted, the Hygienic Laboratory became the National Institute of Health in 1930 and relocated to Bethesda, MD, in 1938.

The Rocky Mountain Laboratory was established in 1902. The Laboratory became part of NIH's Division of Infectious Diseases in 1937. In mid-1948, the Biologics Control Laboratory and the Division of Infectious Diseases, joined with NIH's Division of Tropical Diseases to create two of the four units of the new National Microbiological Institute.

Dr.Victor Haas was the Institute's first Director. In 1955, Congress changed the Institute's name to the National Institute of Allergy and Infectious Diseases to reflect the inclusion of allergy and immunologic research.

1.7.4 The Rocky Mountain Laboratories (RML)

About the time the Hygienic Laboratory was created, other doctors in the mid-west were struggling against a little understood disease. As the population expanded westward, many early settlers in the Montana foothills of the rugged Bitterroot Range of the Rocky Mountains were plagued with a disease known as "black measles," or "spotted fever," now known as Rocky Mountain spotted fever. In 1902, the U.S. Public Health Service sent out a research team to find the cause. Tents, cabins, and an old schoolhouse were used for housing the nascent lab, the predecessor to RML, where researchers determined that the disease was transmitted by ticks, identified the cause of what is now called Rickettsia rickettsii, and formulated a vaccine against the agent. In gratitude, the State of Montana in 1928 built a new facility for RML in Hamilton, MT, which the Public Health Service then purchased in 1931.

In 1937, RML became part of the National Institute of Health. During World War II, the laboratory joined in the war effort by becoming a "national vaccine factory" producing vaccines to protect soldiers against spotted fever, typhus, and yellow fever. After the war, work at the lab returned to its primary mission of basic scientific research of infectious diseases. In 1948, the National Institute of Health was reorganized into the National Institutes of Health, and RML became part of National Microbiological Institute which, as previously noted, became the National Institute of Allergy and Infectious Diseases (NIAID) in 1955. RML remains an active NIH/NIAID research campus. It is one of a limited number of NIH locations with Bio-safety level 3 and 4 facilities that are capable of conducting biodefense research. Current scientists from RML have built upon the history of public health response to infectious diseases by leading efforts against the emergence of MERS virus and the Ebola outbreak in 2014.

1.8 THE MASTER PLAN GOALS AND OBJECTIVES

The NIH seeks to accomplish its mission by:

- fostering fundamental discoveries, innovative research, and their applications in order to advance the nation's capacity to protect and improve health;
- developing, maintaining, and renewing the human and physical resources that are vital to ensure the nation's capability to prevent disease, improve health, and enhance quality of life;
- expanding the knowledge base in biomedical and associated sciences in order to enhance America's economic well-being and ensure a continued high return on the public investment in research; and
- exemplifying and promoting the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science.

The Master Plan supports these mission implementation strategies with the following planning goals and objectives:

1.8.1 Goal 1

Provide a flexible framework for a "living campus", one that can adapt to the needs of current and future NIAID and National Institute of Health programs in support of the scientific mission of the National Institutes of Health.

- Establish a comprehensive and coordinated approach to physical development and orderly growth of NIH facilities.
- Develop building sites, open space, and circulation systems that will ensure appropriate campus facility utilization, functional land use and efficient accommodation of future program requirements.

- Enhance campus function, efficiency and character through better definition of land use and functional relationships.
- Identify patterns of existing development and factors which potentially limit future development.
- Define an achievable development strategy.

1.8.2 Goal 2

Provide an attractive campus whose setting and composition promote collegial interaction and opportunities for informal and formal collaboration and exchange of ideas, expertise, and data

- Develop a comprehensive program and Master Plan that supports the long term goals and missions of NIAID, RML, and the NIH as a whole.
- Stimulate interaction and communications among scientists and staff to enhance quality of research and opportunities for interdisciplinary collaboration through adjacency of uses and creation of formal and informal meeting and gathering spaces on campus.
- Create a flexible development plan that will allow for changing program needs in the future.

1.8.3 Goal 3

Provide a secure, supportive, and convenient work environment for the people involved in RML activities, including scientists and professional administrative staff, visitors, and other non- RML users, with amenities that enhance the quality of life for staff.

- Facilitate the security, safety, and well-being of those who work, or visit RML by constructing site perimeter barriers, effectively screening for contraband and mitigating vulnerabilities through campus and building design.
- Preserve the integrity and build upon the desirable qualities of the RML campus.
- Provide guidelines for use of native landscapes and improving the quality of landscaping.
- Provide accessibility to campus facilities for persons with disabilities.
- Improve and enhance the pedestrian environment and linkages, and create a pedestrian scale within the larger site.
- Preserve and enhance structures with established historic and cultural value.
- Develop a recognizable landscape system that enhances the quality and character of the campus.
- Increase the ease of orientation and direction-finding around the campus.
- Improve pedestrian and bicycle movement on campus.

- Define and communicate building character and scale to achieve a perceivable and attractive identity.
- Provide for the convenience and safety of employees and the neighborhood through sensitively designed site lighting and security measures.

1.8.4 Goal 4

Enhanced appearance of the RML campus to complement the surrounding residential community

- Conserve and enhance the campus perimeter zones, especially bordering residential areas.
- Coordinate with and respond to various regulatory and review agencies that have responsibility for or interest in activities on the campus.
- Establish the scale and height of future RML facilities to limit adverse impact on adjoining neighborhoods or cultural resources.
- Minimize impact of future construction near adjacent residential neighborhoods.
- Endeavor to ensure that the RML and its activities do not contribute to traffic, parking, noise, nuisance lighting, and security or safety issues in adjoining neighborhoods.
- Incorporate native landscape techniques.

1.8.5 Goal 5

Protect, conserve and enhance RML's natural, historic, and scenic resources

- Identify and build upon the unique environmental qualities of the campus and enhance existing and native landscaping and vegetation.
- Enhance campus design to encourage greater RML employee use of bicycles and walking as alternate commuting modes.
- Improve bicycle circulation on the campus.
- Promote efficient use of natural resources.
- Improve management of storm water runoff and lessen water quantity impacts and water quality impacts with the objective of raising conditions above the minimal state requirements, where possible.
- Improve facilities for storage and handling of hazardous materials.
- Encourage sustainable and environmentally-sound development that is sensitive to surrounding neighborhoods and adjacent natural areas.

1.8.6 Goal 6

Foster improved communication about, and better understanding of, NIH goals and policies through the planning process.

- Encourage active dialogue among NIH management, the scientific community and the NIH staff, to foster a better understanding of the ramifications of proposed development policies and plans.
- Encourage continuing active dialogue among NIH and the surrounding community as well as local, state, and federal agencies to resolve campus land use and development issues that affect the community and region.

1.8.7 Goal 7

Meet the Federal Real Property Council's Performance Measures.

- Mission Dependency
- Condition Index
- Facility Utilization
- Operations and Maintenance Costs
- Disposal of Unneeded Assets

Goal 7 is a new goal for the 2015 RML Master Plan Update and reflects the emphasis of the Office of Management and Budget "efficient and effective" spending directives as outline for real property resources in 2012.

1.9 SUMMARY OF PROGRAM FINDINGS

1.9.1 Program

The RML campus is primarily occupied by the National Institute of Allergy and Infectious Diseases (NIAID). All other programing on the RML campus is in support of the scientific research that takes place there. The NIH Office of the Director maintains the amenities, facilities, and security of the campus. The Office of Research Facilities (NIH/OD/ORF), the Office of Research Services (NIH/OD/ORS) and the Office of Human Resources (NIH/OD/OHR) provide staff on site to support of facility maintenance, safety oversight, security, and human resources. The campus is also supported in Bethesda, MD by NIH OD and NIAID staff.

RML has played a key role in our nation's health and well-being by focusing its talent and resources on the infectious disease threats of the day. One hundred years ago, that meant helping overcome the scourge of "black measles," which was striking down settlers in Western Montana's Bitterroot Valley at an alarming rate. Today, it means grappling with the more confounding health issues such as prion diseases and antibiotic-resistant bacteria. The Rocky Mountain Laboratories (RML) is perhaps best known for its research into vector-borne diseases, such as Rocky Mountain spotted fever, Q fever, and Lyme disease. Its proven history in the study of exotic illnesses makes RML eminently positioned to play a central role in conducting research that could help safeguard the public against infectious disease threats, including a possible bioterrorist attack. RML serves as a lead resource for the NIH response to public health emergencies illustrated by the recent outbreaks of emerging viral diseases such as MERS and Ebola virus.

RML is not a clinical facility in which researchers study the effects of experimental drugs, vaccines, and diagnostics on patients and healthy volunteers. Instead it is the basic research conducted at RML that makes clinical research possible. By focusing on the molecular traits of a given microbe—namely, what the microbe is composed of and how it behaves in its environment—scientists are able to ascertain the most effective target for fighting that microbe and, from there, develop chemicals that could detect, treat, and generate an immune response against it for further study.

The scientific programs at RML are organized into five separate Laboratories including the Laboratory of Intracellular Parasites; the Laboratory of Persistent Viral Diseases; the Laboratory of Zoonotic Pathogens; the Laboratory of Virology and, the Laboratory of Human Bacterial Pathogenesis. Each Laboratory has a distinguished scientist as its Laboratory Chief, and a number of individual research groups that study specific infectious agents, like Q fever, Chlamydia, Lyme disease, human immunodeficiency virus (HIV), plague, tularemia, Salmonella, prion diseases, and tick-borne encephalitis viruses.

The Rocky Mountain Veterinary Branch (RMVB) provides support to the Laboratories through centralized animal care including animal husbandry, clinical care, breeding, shipping and receiving, disease surveillance, and technical scientific support that includes performance of surgeries, experiments, administration of experimental materials, collection of tissue samples, and necropsies. This Branch ensures compliance with the Animal Welfare Act, PHS and NIH Animal Care and Use Policies, DHHS Guide for the Care and Use of Laboratory Animals, and accreditation standards for the Association for Assessment and Accreditation of Laboratory Animal Care (AALAC).

Other resources on the RML campus include two NIAID core facilities, centrally located facilities that house state-of-the-art technologies for use by NIAID researchers in Hamilton, MT, as well as Bethesda, MD.

The Genomics Core Unit provides cutting-edge technology and consultation to researchers in the areas of gene sequencing and gene expression. Researchers receive results rapidly and in an easy-to-understand format that enables them to quickly determine potential vaccine candidates, diagnostics, and the like.

The Microscopy Core Unit offers unparalleled expertise and instrumentation in electron and confocal microscopy. RML's microscopy staff prepares and analyzes samples in a variety of ways, from labeling cellular organelles to highlighting the exquisite surface detail of a microbe to identifying surface antigens on that microbe. In addition, specimens can be observed in real-time by NIAID researchers in Hamilton and Bethesda. Work performed at RML has been featured on the covers of numerous prestigious scientific journals, including Proceedings of the National Academy of Sciences, Virology, and Nature.

1.9.2 Program Needs

Functional and personnel needs over the next 10 years were projected by NIAID and ORF as part of the 2013 Build and Space Plan meetings that the Division of Facilities Planning conducts on an annual basis. It was agreed that RML Master Plan is still applicable. Recent projects, that were in the master plan and have now been constructed, have been added to the Master Plan Update existing conditions. Several new considerations could be be incorporated. Actual allocations of space to scientific staff will be made by NIAID as the needs of specific research programs and the facilities are determined.

The following Program Needs have been identified by NIAID Leadership, Staff and ORF and ORS staff. This information was gathered through the Building and Space Plan Meetings, the 2014 Rocky Mountain Laboratory Physical Security and Space Needs Assessment and interviews.

- **BSL-2 and BSL-3 laboratories:** Currently the BSL-2 and BSL-3 labs are fully occupied and utilized. The lack of (A)BSL-3 space is particularly limiting for the NIH response to infectious disease outbreaks. In fact, this condition requires frequent utilization of the (A)BSL-4 space in the Building 28 IRF for BSL-3 agents. Some studies (i.e. pandemic flu) cannot be completed in the current (A)BSL-3 labs and vivarium because there is no provision for shower-out as required by the Biosafety in Microbiological and Biomedical Laboratories (BMBL). The project justification documents for Building G in the 2009 RML Master Plan call for approximately 16,200 NASF of BSL-2 labs, 6,100 NASF of BSL-3 labs, and 5,200 NASF of vivarium space to meet this program need.

- **Specialized animal research space:** NIAID research would be enhanced by animal research and holding facilities for exotic animals from the field (i.e. bats and birds), native animal quarantine (i.e. squirrels) and ABSL- 3 Non-human primate research space.
- **Computational Research Center:** RML NIAID needs flexible and scalable IT infrastructure to support unpredictable computational and storage growth. NIAID plans to develop a multi-tiered storage strategy that aligns to unique data flows and accommodates growth for next 10 years.
- **Administrative Space:** NIAID is finding that locating their administrative support services on the RML campus provides a stable, cost effective employee pool. They plan to expand their Procurement Group to support both RML and Bethesda campus laboratories
- **Conference and Collaboration Space:** Large auditorium with capacity to accommodate RML staff as well as small conference rooms and collaboration spaces
- **Archival storage:** Long term storage for biological study samples.

- **Replace functionally unsuitable buildings**: Many service and storage functions are housed in trailers and containers. These are not temporary functions and therefore should be housed in permanent facilities for efficiency and safety. Programs that need permanent facilities include the service and storage functions in the HD and SS buildings.

- **Service and Support Facility:** A consolidated facility for current and future maintenance personnel as well as the NIH Police and the Division of Occupational Health and Safety (DOHS).

- **Waste Storage facility:** A marshalling facility for items RML intends to hold for a short period of time before they would be removed from campus by individuals or private contractors. These items would include recycled waste, general waste, and surplus equipment awaiting donation or removal from campus. An outside storage yard should contain closed compacting-type dumpsters for trash and recycled waste. The yard should be screened from off-site views.

- **Vehicle storage:** Hazardous Material Response truck garage for two existing vehicles

- **Increased utility capacity:** New laboratory, animal facility and computational research functions, if built, would place a higher load on the existing utilities (chilled water, power and IT connectivity). The campus utilities would need to be augmented to accommodate this added demand.

1.9.3 Growth

1.9.3.1 *Personnel Growth Estimates*

If the campus develops as planned, the RML population could, potentially, grow 40 percent from its current population of 372 Employees, Contractors and Fellows (July 2014 NIH census) to a total campus population of 511 by the end of the planning period. The primary growth at the campus would be in Intramural Research personnel and NIH support staff. NIAID programs continue to expand on the RML campus in the areas of genomics, proteomics, imaging, and high throughput sequencing with additional need for dry lab and administrative office spaces.

1.9.3.2 *Programmed Built Area*

Total building area could increase from 363,266 existing gross square feet (gsf) to an estimated 506,126 gsf, in order to address potential new research needs and to correct existing deficiencies. Over this period an estimated 26,290 gsf of existing space could be demolished and an estimated 169,150 gsf of new space could be constructed. The largest programmed growth component would occur within the second phase of the plan (depending upon NIAID program priorities and availability of resources) due to the construction of a new laboratory. The following tables set forth gross area and population plans by major functional unit.

Current Projects requested for the RML campus are:

- The RML Computational Biology Center would be a new computational research laboratory at RML for purposes of science support as well as to provide sufficient redundancy for NIAID cyber-network consolidation efforts. It would support existing growing programs with large computational science capacity requirements. The RML Computational Biology Center was not included in the 2009 RML Master Plan.
- A New RML Research Facilities (Building G) of approximately 30,000 net assignable square foot (NASF) BSL3 and BSL2 laboratory space, including, vivarium, administrative, computational, cyber infrastructure, building support spaces and distinct areas designed for minimal vibration to support sequencing equipment used for new and existing NIAID programs, including the Laboratory of Persistent Viral Diseases, Laboratory of Virology, Laboratory of Zoonotic Pathogens, the Research Technology Branch, and the Office of Cyber Infrastructure and Computational Biology. The new RML Building G was included in the 2009 Master Plan and therefore the program and personnel estimates were accounted for in that document.

- A draft POR for a structure called “Building C” was completed in April, 2014. The Building C program is organized around the need for permanent spaces (vs. the current trailers) for ORF Maintenance NIH Police and the DOHS offices. These spaces include shops, storage, offices, shared common spaces, health service space, and training space. Other supporting space will include break rooms, lockers, toilets, kitchen and conference facilities, building support facilities, and exterior vehicle storage.

1.9.4 Long Range Plans

Future areas of research are difficult to predict. Research is either investigator-initiated or congressionally-mandated in response to public concerns. The IRF is an example of the current emphasis on congressionally directed research in the area of biodefense. The NIAID conducts and supports much of the research aimed at developing new and improved medical tools against potential bioterrorism agents. Since 2001, NIAID has greatly accelerated its biodefense research program, launching several new initiatives to catalyze development of vaccines, therapies, and diagnostic tests.

NIAID, like other ICs, has formal, long range strategic plans in place or under development, and these can be viewed on the NIAID website at the following address: Link to http://www.niaid.nih.gov/about/whoweare/planningpriorities/.

1.10 SUMMARY OF SITE DATA

The following information summarizes data gathered during the RML master planning effort. All areas and parking indicated as “planned” represent what would be needed to accommodate the population based on the IC’s projection of research demand.

Exhibit 1-1: Site Areas

	Baseline (2005)	Baseline (2014)	2015 Planned
Site Size:	33+ acres	36.6 acres	36.6 acres
Developed Area [1]	~9 acres (27.2%)	13.7 (37.4%)	17.0 (46.4%)
Open Area:	~24 acres (72.8%)	22.9 (62.6%)	19.6 (53.6%)

Exhibit 1-2: Population

Baseline (2014) Campus Population	372
Projected Phase 1 Campus Population	382
Projected Phase 2 Campus Population	475
Projected Phase 3 Campus Population	497
Projected Phase 4 Campus Population	511

Exhibit 1-3: Building Areas

Baseline (2014) Building Area:	363,266 GSF
Projected Demolition Building Area at Phase 4 Completion	(26,290) GSF
Projected New Construction Building Area at Phase 4 Completion	169,150 GSF
Total Building Area at Phase 4 Completion	506,126 GSF

[1] Developed area includes all impervious surfaces (buildings, roads, parking lots and walkways)

Exhibit 1-4: Parking

	2014 Baseline Standard Parking Spaces	2014 Baseline Handicap Parking Spaces	2014 Baseline Total Parking Spaces	Phase 4 Completion Total Parking Spaces
Staff Parking	273	12	285	360
Visitor Parking	24	2	26	26
Total	297	14	311	386

1.11 PLANNING PREMISES

1.11.1 Population Growth

In 2009, the RML campus population totaled 336. The total 2014 campus population was 372. The total estimated population at the end of the 20-year planning period is projected to be 511 with primary growth at the campus expected to be among the Intramural Research personnel.

1.11.2 Building and Land Use

1.11.2.1 *Research Facilities*

Research facilities fall into three major categories: biomedical research laboratories, animal research facilities, and clinical research facilities. There are no clinical research facilities on the RML campus. All existing and propose laboratory buildings on the RML campus are bio-containment laboratories that meet the biosafety requirements (by construction, equipment and laboratory practices) for the protocols being conducted.

Biosafety is the application of safety precautions that reduce a laboratory occupants risk of exposure to a potentially infectious microbe and limit contamination of the work environment and, ultimately, the community.

There are four laboratory biosafety levels (BSL1-4) and four animal facility biosafety levels (ABSL1-4). Each level has specific controls for containment of microbes and biological agents. The primary risks that determine levels of containment are infectivity, severity of disease, transmissibility, and the nature of the work conducted. Origin of the microbe, or the agent in question, and the route of exposure are also important. At RML the existing lab and animal space is biosafety levels 2, 3 and 4. The BSL-4 space is limited to Building 28.

1.11.2.2 *Administrative Facilities*

Administrative facilities or offices are a component of the RML campus. NIAID administrative supports the intramural program. Administrative facilities are personnel intensive.

1.11.2.3 *Maintenance and Support Facilities*

Support facilities consist of mixed-waste facilities, storage facilities, and crafts shops. Some of the support facilities could be replaced due to their location or their poor condition.

1.11.2.4 *Public Safety Facilities*

Public safety facilities include the Division of Occupational Health and Safety, police station, and other physical security facilities. These functions are currently spread throughout the RML campus and could be consolidated.

1.11.2.5 *Utility Facilities*

This master plan envisions constructing additional computational research facilities, biomedical research laboratories, and animal research facilities on the RML Campus should funds become available. These new facilities would be energy intensive. As a result, NIH may need to expand its steam, chilled water, and electrical generation capacity. Utility and services would continue to be developed in accordance with the 2010 RML Master Utilities Plan.

1.11.3 Open Space

A continuous open space system should continue to be developed, as much as possible, to enhance the sense of unity, order and scale on the campus. A western river-oriented park area would be created for informal as well as organized outdoor activities, although some of the zone would be inside the perimeter fence.

Landscaped elements of special value should be preserved and additional landscaping, signage, and street furniture should be developed to enhance the working environment. New landscaping should be developed based on native species that do not require continual watering.

1.11.4 Transportation / Circulation

Since the 2009 Master Plan, a well-defined campus loop road with secondary drives for service accessibility has been established to increase efficiency and protect both open space and pedestrian corridors; a single consolidated lot in the north portion of the campus was constructed, and additional visitor parking has been constructed within the expanded campus boundaries.

The primary campus entry remains on 4th Street near Grove Street, directly into the Visitors' Center. With some exceptions, commercial and other service vehicles are and would continue to be restricted to the service entrance at the north end of the site. All deliveries continue to be made at Building 29 (the Shipping and Receiving Building) where screening is performed. On-site service vehicles use the campus circulation system to access delivery and service areas.

Traffic impacts of future campus development would be mitigated on the surrounding roadways serving the campus to the maximum extent possible. The pedestrian character of the campus, which is conducive for pedestrian and bicycle use, will continue.

1.12 PROGRAM PREMISES

1.12.1 Personnel Growth Estimates

Current personnel reports and personnel projections for the next 20 years, provided by RML staff and NIAID management are described in Section 1.9 and summarized in Exhibit 1-2. This data provides the personnel basis for computing building area requirements.

1.12.2 Space Programs

Current gross areas and estimated gross area requirements are summarized in

Exhibit 1-3. Gross building areas are from the NIH Real Property Database, which NIH adjusts quarterly and reports to HHS.

This Master Plan Update did not recalculate the estimated gross areas if the building programs were still considered valid by NIH and NIAID. The area calculations were determined in the 2009 Master Plan as described below.

- In accordance with the NIH Design Policy and Guidelines (DPG) for master planning, Laboratory and Laboratory Support spaces are allocated at 180 and 90 net square feet per researcher, respectively, with a grossing factor of 1.8 to determine gross area. Actual space allocations would be made by NIAID as the needs of specific research programs are determined.

- BSL3 Laboratory spaces are programmed based on needs described in the interviews with research staff. These are shared by researchers and considered to be shared support rather than assigned space.
- Office space per tenant is allocated, in accordance with direction given by the Steering Committee, at 100 net square feet for laboratory chiefs, principal investigators, and administrative staff, and 60 net square feet per person for post-doctoral fellows.
- Conference/Library, Storage and Staff Break and Locker spaces are programmed in accordance with NIH Lab Administrative Space Recommendations, dated June 1991.
- Director's Reserve is programmed as laboratory space assigned from time to time, at the discretion of the Director, DIR, NIAID for temporary research accommodation pending provision of permanently assigned space.
- Rocky Mountain Veterinary Branch (RMVB) and Administrative Services are programmed based on staff interviews and responses to program questionnaires.
- Amenities are programmed by type and square footage based on the approved Guidelines for Amenities and Services within NIH Facilities, December 2004.
- Support Space is programmed based on staff interviews and responses to program questionnaires. Also included in this category are security-related support facilities such as the Visitors' Center and the Shipping and Receiving Building which complete the perimeter security system. Associated guard houses at the various gates are not tabulated in the areas.

1.13 SECURITY CONSIDERATIONS

1.13.1 Background

The RML campus is a federal installation, and potentially vulnerable to various kinds of threats. The campus, though it has long had a perimeter fence, has maintained an open, academic-like character in deference to the spirit of intellectual interaction, and access to the surrounding public. Several buildings are frequented by visiting scientists, scholars, tradespeople, messengers, contractors, and others throughout the business day. The campus is also the site for meetings of researchers, academicians, and others. The addition of conference facilities would increase the number of visitors to the site.

Following the April 1995 bombing of the Alfred P. Murrah Federal Office Building in Oklahoma City, the Department of Justice was tasked with developing a "Vulnerability Assessment of Federal

Facilities" which was released in June 1995. Immediately thereafter, former President Clinton in a Presidential Directive, ordered all agencies to begin a security upgrade process, and in October of the same year, by Executive Order 12977, established the Interagency Security Committee to develop and ensure compliance with government-wide physical security criteria.

NIH developed its Security Assessment in response to the Presidential Directive in August 1995, but the absence of significant new physical security funding delayed action by nearly all federal agencies. In the summer of 2001, the HHS Office of the Inspector General reviewed the RML campus physical security and made recommendations for physical and operational security improvements which have largely been implemented. These include:

- Improved perimeter security by installing a more secure perimeter fence with a limited number of controlled entry and exit points;
- Constructing a visitors center and parking facility;
- Installing additional surveillance and new barriers;
- Improved staffing of security;
- Constructing a centralized shipping, receiving, and storage facility;
- Improved interior building security; and
- Improved security planning.

1.13.2 Specific Measures

- A perimeter fence with vehicular and pedestrian gates surrounds the entire campus.
- Gates provide access for employees and visitors on foot or bicycle at the east side of the campus entering from 4th Street. Employees and their vehicles are screened in various modes depending on the Alert Level issued by the Department of Homeland Security (DHS). Generally, visitors, including most vendors, arriving at this location, park in the special visitors' lot, and proceed to the interior of the campus after screening in the Visitors Center, and walk or are driven to their destinations. Visitors' vehicles remain in the parking lot outside the perimeter fence.
- Protective barriers of various kinds that protect against vehicle ramming have been provided at entrances and other areas of potential vulnerability.
- A centralized shipping, receiving, and storage facility with screening capabilities is located in the northeast corner of the property with a separate gate and sally-port arrangement to control access by commercial vehicles. Generally, commercial deliveries are off-loaded at the Shipping and Receiving Building, screened, and delivered by government-owned vehicles to the interior of the campus.

1.13.3 Security Management

- Improved security planning, staffing and operations have been enhanced by the creation of a Division of Security and Emergency Response (SER) under the Office of Research Services (ORS) in the NIH Office of the Director.
- All NIH physical security programs are addressed through and by organizational entities in the SER service cluster. The Associate Director for Research Services is the Security Officer for NIH, who is advised by a Security Operations Advisory Committee.
- The SER combines emergency management, security planning and management, police, fire fighting and prevention, and crime prevention activities within a single, full-service organization which ensures that all emergency incidents are coordinated and controlled through and by a single entity, sharing available resources to provide optimal services to the NIH nationwide.
- NIH's SER regularly performs security surveys of its buildings, and maintains liaison with other law enforcement agencies in Hamilton, Ravalli County, the State of Montana and federal agencies within the state for mutual assistance, when needed.
- The SER service cluster also provides: (1) coordination of all emergency response services for fires, rescues and medical emergencies, and hazardous materials incidents, with local emergency response agencies, especially the City of Hamilton volunteer fire department, and adjacent communities as appropriate. (2) fire protection and prevention activities including fire protection engineering services and, (3) emergency preparedness direction and coordination for the NIH.
- The NIH Division of Police is a highly trained full service federal police agency with exclusive jurisdiction on the RML enclave. The Division of Physical Security Management, composed of specially trained Security Specialists, performs security reviews of all NIH buildings and facilities nationwide on a continuing basis. All security measures, including locking hardware, electronic access systems, and other physical plant protection devices as well as operational procedures, are reviewed continuously to identify security vulnerabilities. Improvements are made as necessary to ensure that protective measures in place are consistent with any identifiable risks to persons or property.
- The access to certain areas within buildings, such as those containing hazardous materials or processes, animals and sensitive research, and to building entrances after hours, is controlled by centrally-monitored systems.

1.14 FIRE AND LIFE SAFETY

The NIH Division of the Fire Marshal acts as the "Authority Having Jurisdiction" in all matters affecting fire and life safety at the RML.

1.15 RELATIONSHIP TO THE ENVIRONMENTAL IMPACT STATEMENT

The National Environmental Policy Act (NEPA) of 1969, as amended, 42 U.S.C. §§ 4321 et seq., commits federal agencies to "…utilize a systematic, interdisciplinary approach which will ensure the integrated use of natural and social sciences in planning and decision-making that may have an impact on the human environment." Prior to undertaking major actions, federal agencies must identify alternatives and significant environmental issues, include economic and social impacts in the environmental analysis, and involve the public in the review of the environmental document.

The Master Plan EIS was prepared in accordance with these directives for the 2009 RML Master Plan. An Environmental Assessment (EA) of the changes proposed in this 2015 RML Master Plan update will be completed by the ORF Division of Environmental Protection.

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2 COMMUNITY CONTEXT

2.1 LOCATION OF THE RML IN THE REGION

The Rocky Mountain Laboratories (RML) is located in Hamilton, a small community in southwestern Montana approximately 46 miles south of Missoula. Hamilton is the largest city in Ravalli County and serves as the county seat. The city of Hamilton adopted its first Comprehensive Master Plan in 1998 and updated this document as a Growth Policy in 2003. The latest update was undertaken in 2008 and published in 2009. The current Zoning Map, as amended on July 3, 2012, identifies RML as a Public Institutional (PI) use which is described in the Hamilton Municipal Code as follows:

- The public and institutional district (PI) establishes zoning to accommodate those public and institutional uses which are related to the health, safety, educational, cultural and welfare needs of the city. All proposed uses for the PI district require a conditional use permit. Permitted uses tend to include colleges and schools; convention and cultural centers; churches; government-owned facilities, including fire stations, parks and playgrounds; fairgrounds; and non-profit organization facilities.

RML is bounded to the north and east by single-family residential (RS) zoning, although there is a parcel located north of the campus that is unincorporated. The land adjacent to the west is zoned PI and much of that area is within the River Park and the Bitterroot River floodplain. To the south is the city boundary. It is bordering single-family residential properties that are located in Ravalli County. Refer to Exhibit 2-1.

As federal property, the RML campus is not subject to local zoning rules. The National Institutes of Health (NIH), nonetheless, has briefed local officials on actions discussed in the 2009 RML Master Plan and will continue to solicit their feedback regarding development of the campus.

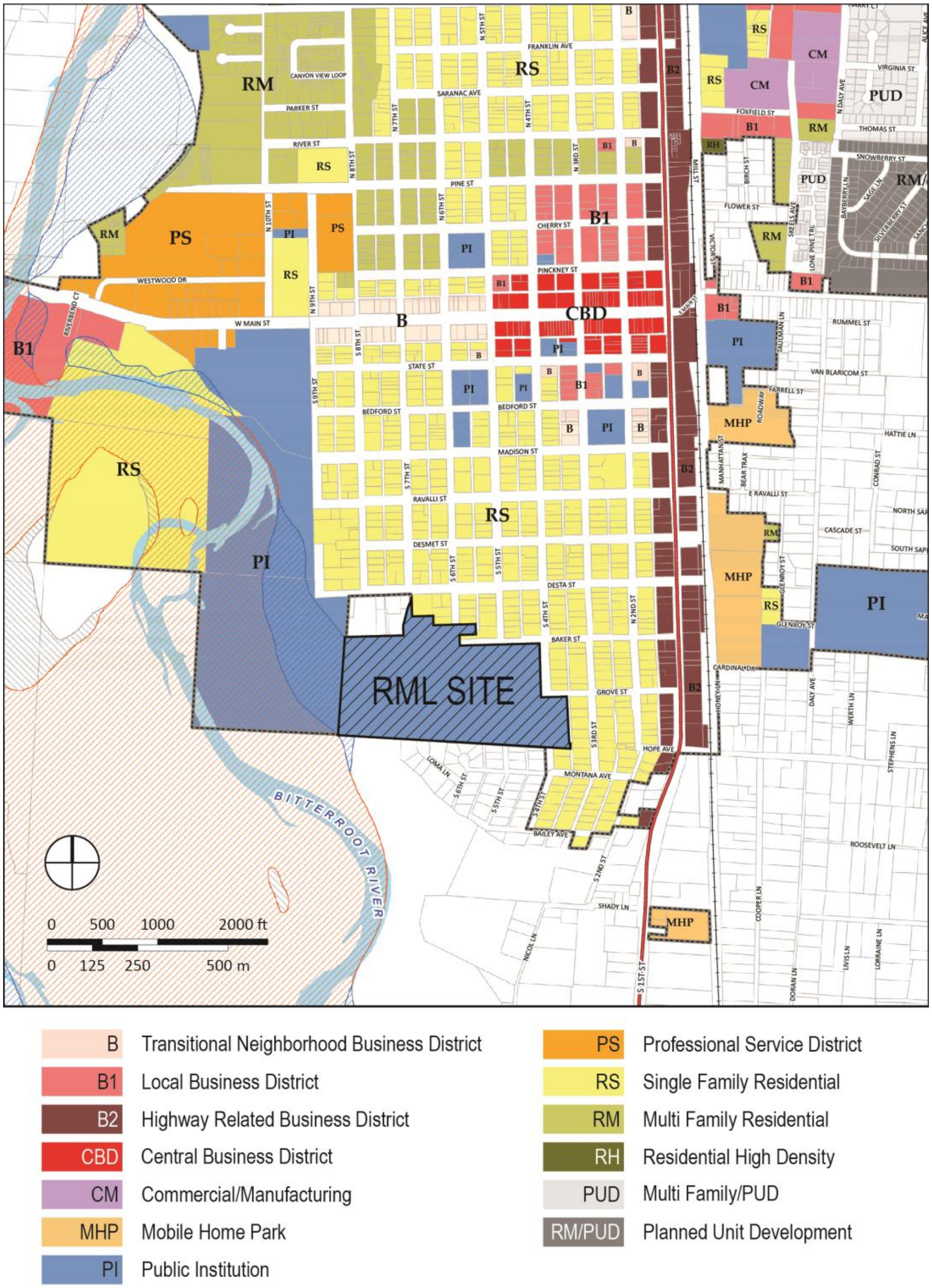

Exhibit 2-1: Hamilton, MT Zoning Map

2.1.1 History of Hamilton and RML

Hamilton was founded by copper king Marcus Daly in the late-nineteenth century. As described on the City of Hamilton's web site, Daly's mines required a consistent supply of timber and a mill to support the timber operations. The city, in turn, was designed to support the mill. The city of Hamilton was incorporated in 1894 and was named after James Hamilton, a Daly employee, who platted the city along the route of the Northern Pacific Railway in 1890. When Daly died in 1900, Hamilton was the commercial center of the Bitterroot Valley and the seat of Ravalli County.

As the population expanded westward, many early settlers in the Montana foothills of the rugged Bitterroot Range of the Rocky Mountains contracted a disease known as "black measles," or "spotted fever," now known as Rocky Mountain Spotted Fever. In 1902, the United States Public Health Service sent out a research team to find the cause. Tents, cabins, and an old schoolhouse served as research facilities, where scientists determined that the disease was transmitted by ticks, identified the cause of what is now called *Rickettsia rickettsii*, and formulated a vaccine against the agent.

In gratitude, the State of Montana built a new facility in 1928, which the Public Health Service then purchased in 1931, resurrecting a local economy that had gone into decline.

Hamilton is presently home to two microbiological research and production facilities, namely: the federal government's RML, as well as the privately owned Glaxo Smith Kline research laboratory and production facility that was purchased in 2005 from the now defunct Corixa Corporation.

2.1.2 Geography

Ravalli County is part of a north-south mountain valley bordered by the Sapphire Mountain Range on the east and the Bitterroot Mountains on the west. The Bitterroot Valley is named for the Bitterroot Flower, the Montana state flower. Hamilton, like much of the county, is adjacent to the Bitterroot River which drains the valley.

According to the U.S. Census Bureau, the county has a total area of 6,217 km² (2,400 mi²). 6,201 km² (2,394 mi²) of it is land, and 16 km² (6 mi²) is water. Only 0.25% of the total area is water.

Hamilton is located at 46°14'54" North, 114°9'35" West (46.248412, -114.159852) GR1. According to the U.S. Census Bureau, the city has a total area of 2.5 mi², none of which is considered water as defined by the Bureau. The Bureau's calculations exclude areas occupied by bodies of water such as the Bitterroot River. RML is immediately adjacent to the river with some floodplain and wetlands at the western end of the site. It has an altitude of approximately 3,500 feet above sea level.

Neighboring communities include Pinesdale and Corvallis to the north and Grantsdale to the south. Other communities in the county are Darby, Florence, Stevensville and Victor.

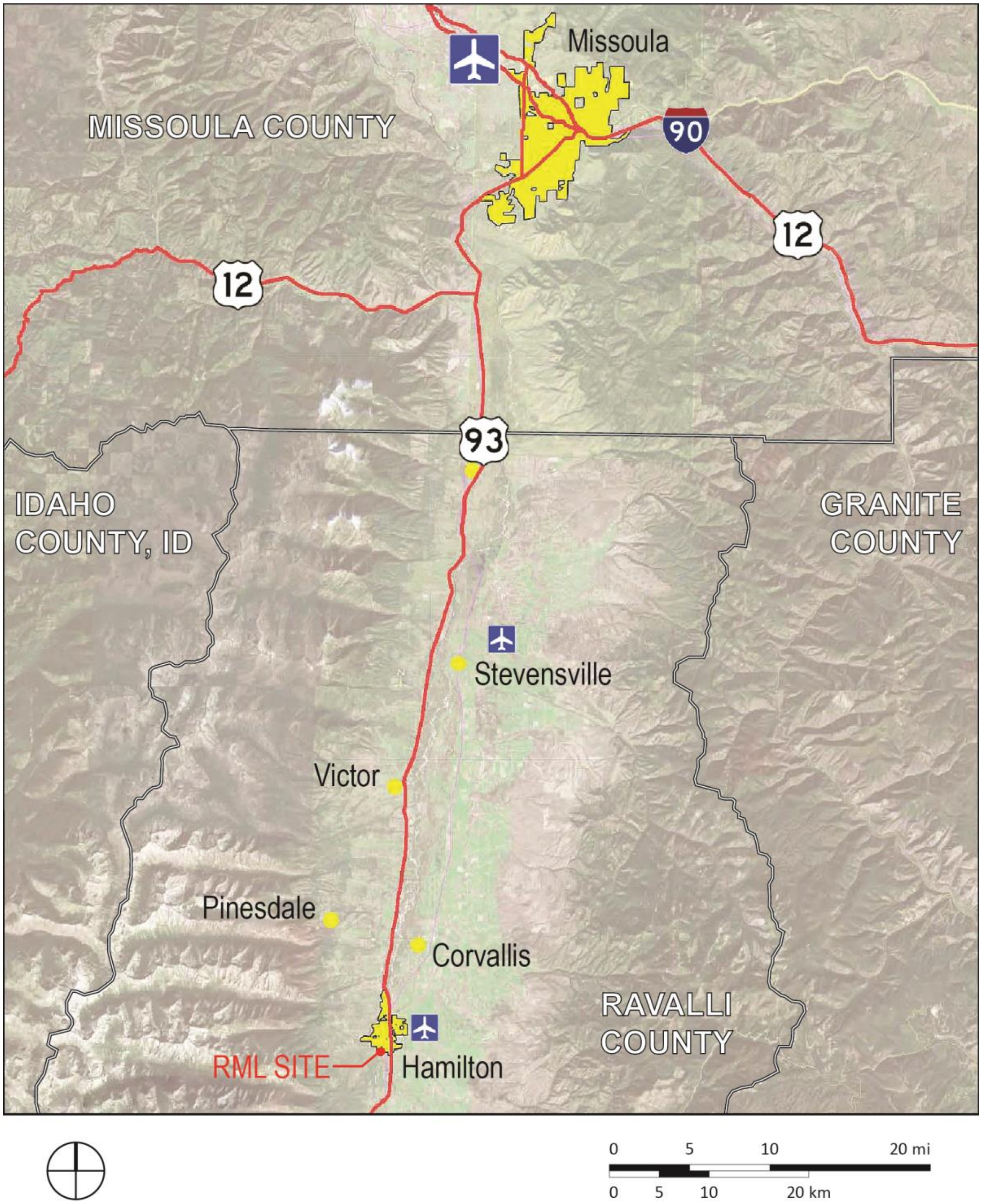

Exhibit 2-2: Regional Context

2.1.3 Regional Context

As previously noted, Hamilton is located in the Bitterroot Valley between the Bitterroot River and the Bitterroot Mountain Range to the west and the Sapphire Mountain Range to the east. Refer to **Error! Reference source not found.**. The city is built along U.S. Route 93 (1st Street within the city), a popular route for travelers between Yellowstone and the Glacier National Park, and a freight rail line operated by Montana Rail Link, Inc., both of which run north-south roughly paralleling the Bitterroot River which joins the Clark Fork River of the Columbia River Basin in Missoula, MT.

The highway is especially significant since it is the primary route to Missoula County and the city of Missoula to the north with its population of over 66,000, the University of Montana main campus, the Northern Region headquarters for the U.S. Forest Service and other employment centers. Residents of Ravalli County and Hamilton regularly commute to Missoula for work.

Missoula has an international airport, while Ravalli County has a small airport for non-commercial aircraft. In addition, Missoula contains the nearest major medical care centers with the 253-bed St. Patrick Hospital and the 146-bed Community Medical Center each of which provides more facilities and care than currently available from the 25-bed Marcus Daly Memorial Hospital in Hamilton, the only hospital in Ravalli County.

Both Ravalli County and the City of Hamilton experienced rapid growth in the early part of the 2000s and thus have since adopted Growth Policies to control future expansion. Ravalli County's Growth Policy was adopted by its county commissioners in 2004. It residents, however, repealed it by a vote in 2008. Hamilton's policy was adopted in 2003; was updated in 2008 and published most recently in 2009.

According to the Hamilton Growth Policy (2003):

The City of Hamilton's jurisdictional area consists of 1.8 square miles of land area within the city limits. Its anticipated planning area extends several miles in all directions beyond the city limits. In general, the city is an urban community that has developed with a broad mix of land uses including housing, commercial, industrial, public, recreation and open space uses. Hamilton, to a large part, is built out within the existing city limits. The residentially zoned parcels located in the city limits are mostly infill projects. The existing commercial and industrial lands within the city limits are available for new development primarily along Route 93.

and:

The constraints on potential land uses within the city are divided between those that are a part of the city's natural endowment, and those that result from man-made structures and activities.

Constraints Resulting From Nature

- *Twenty-five percent (25%) of the city is within the flood hazard area. Flooding may be expected in extreme conditions in the event of a 100-year flood.*

Constraints Resulting From Human Activities

- *Route 93 divides the city on its north/south axis, presenting both opportunities and constraints. As a constraint, the highway literally divides Hamilton in two. However, the city has both visual and direct access from the highway as well as visual highway frontage for commercial and/or industrial users. Route 93 provides the primary source for regional access to and from the city. There are some industrial and commercial businesses located throughout the city that are involved in the processing, storage, and/or manufacture of a wide variety of goods and materials that benefit from the highway access.*

Taken together, these observations suggest that the region will continue to grow along the north-south axis of the river and Route 93.

2.2 TRANSPORTATION

2.2.1 Automotive

Ravalli County has approximately 1,450 miles of public roadways. Approximately 550 miles of these roads are maintained by the county Road & Bridge Department that is headquartered in Hamilton. Of the 550 miles of roadway approximately 300 miles are paved and 250 miles are graveled.

Travel in Ravalli County and Hamilton is made predominantly by private vehicles. However, since 1976, the Ravalli County Council on Aging (COA) has been providing a demand-response service five days a week using an ADA-accessible 14- passenger van. The service is headquartered in Hamilton. In addition, Bitterroot Taxi provides taxi service within Hamilton, and Royal Limousine Service is licensed to provide service between all points and places in Missoula and Ravalli Counties. An airport shuttle is also available from the Missoula International Airport. The Missoula Ravalli County Transportation Management Association coordinates vanpool, carpool, and guaranteed ride home programs.

2.2.1.1 Hamilton Transportation Planning

The Hamilton Area Transportation Plan, updated in 2009 and adopted in 2010, includes an examination of the traffic operations, roadway network, transit services, non-motorized transportation system, trip reduction strategies, and growth management techniques. It also identifies concerns and recommends improvement projects and progressive programs that will address existing concerns and/or meet future needs.

The roadway system in Hamilton is defined using a functional classification system. The types are as follows:

Principal Arterials: U.S. Route 93

- Function: Mobility

Major Collectors: SR 269 (East Side Highway) and SR 531 (Main Street)

- Function: Land access/Mobility

Minor Collectors: All other local collector streets in Hamilton

- Function: Land access/Mobility
- Collectors are intra-community highways connecting residential neighborhoods with community centers and facilities.

Local/Residential Streets: all remaining residential and commercial streets

- Function: Land access
- Primary function of local/residential streets is access to abutting properties. Local streets include a variety of designs and spacing depending on access needs. Local streets typically have low traffic volumes and provide internal circulation and undivided roadway access to residential development boundaries and small community facilities.

On the arterial system, primary north/south arterial travel is provided by Route 93, with two lanes in each direction. Secondary east/west travel is provided by Main Street, Fairgrounds Road and Golf Course Road. Each of these facilities currently operates with one lane in each direction.

2.2.1.2 Access to RML

Streets surrounding and serving the RML campus are classified as Local/Residential Streets, and the city's Transportation Plan does not propose to change or widen these with the exception of a recommendation to install on-street bicycle lanes on both sides of 4th Street, with appropriate signage, from Adirondac Avenue through Grove Street.

RML's main entrance for employee and visitor vehicles is on South 4th Street which is connected to Route 93 approximately three blocks to the east by a number of east-west streets—the nearest being Grove and Baker Streets. There is a designated truck route for commercial deliveries and contractor traffic to the commercial vehicle entrance on the north side of the property at 5th Street. Incoming traffic comes from Highway 93 west on Desta to 5th Street and outgoing traffic goes north on 5th Street to Ravalli the east to Highway 93 at the traffic light.. Properties to the south of the RML campus are generally accessible by Montana Avenue which connects with Route 93 via Hope Avenue.

2.2.2 Rail

A single-line Federal Railroad Administration Class 2 freight line runs 64.7 miles from Missoula, through four stations including one in Hamilton, to Darby. Traffic has historically fluctuated but remains low. Most of the line is restricted to a 25 mph speed limit, which decreases to 10 mph near Hamilton and Darby. It has limited load capacity, many grade crossings and was deemed at risk of abandonment in a 2004 Branch Line Study due to low traffic density. There is no known consideration by the owner, Montana Rail Link (MRL) of upgrading or adapting this line for potential passenger use. Amtrak only operates a route across northern Montana.

2.2.3 Air

2.2.3.1 Ravalli County Facilities

Hamilton is served by the Ravalli County Airport which is a public use facility. It operates typically during dawn to dusk hours, with 24 hour runway lights available at request. It has a paved, 4,200 ft. runway and accommodates small, private single and multiple engine and jet aircraft, commercial air taxi, and general aviation helicopter.

2.2.3.2 Missoula International Airport

Commercial air service is via the Missoula International Airport which is located about 46 miles north of Hamilton. The airport is served by four airlines that offer direct flights to twelve major U.S. markets. There are no regularly scheduled international flights at this writing.

2.3 UTILITIES

2.3.1 Water Supply

The City of Hamilton pumps water from seven groundwater wells spread throughout the distribution system. The capacity of these wells ranges from 285 to 900 gallons per minute (gpm), with a theoretical permitted combined capacity of 4375 gpm. All of these wells are treated by chlorine disinfection. The water system of City of Hamilton is currently served and pressurized by a 1.0 million gallon pre-stressed, post-tensioned reservoir located on a parcel of land southeast of the City. According to the City of Hamilton 2010 Water Facility Plan Update dated March 2010, the forecasted average day demand for the system was 1.8 million gallons per day (mgd) and maximum day demand 3.0 mgd respectively in 2010.

The city water system includes a 12-inch diameter water main in Golf Course Road connecting the storage reservoir to the 10-inch diameter main located in 1st Street. RML installed a 12-inch water main from 1st Street down Grove Street to the RML Campus in 1995. The city has 6-inch diameter cast iron water mains in 2nd, 3rd, and 4th Streets adjacent to the RML campus that connect to the 12-inch main. This main, installed by the Government, improved the city's distribution system and pressure. The city water pressure is approximately 60 psi. The city can supply more than 2,000 gpm at the corner of 4th and Grove Streets - the RML connection point.

2.3.2 Storm Water

Storm water is currently drained locally on the RML campus by dry wells and shallow drainage swales that discharge to groundwater. According to the Hamilton Growth Policy, this is a common form of storm water management in the Hamilton area. Dry wells or sumps are frequently used on public right-of- ways, public lands, and commercial properties. There is neither a municipal storm water drainage system at this time, or any known plan to add one.

2.3.3 Sanitary Sewer and Wastewater Treatment

Currently, wastewater generated at RML is discharged to the sanitary sewer system operated by the City of Hamilton Department of Public Works (CHDPW). The original wastewater treatment plant was constructed in 1984 and is located at the west end of New York Avenue adjacent to the Bitterroot River.

According to the City of Hamilton Wastewater Facilities Plan 2006, the design capacity of the plant is 2 million gallons per day. In year 2006, the average daily treated wastewater flow was 0.74 mgd with a peak day summer flow of 1.49 mgd. The peak hour winter flow was 2.02 mgd and peak hour summer flow hour was 2.79 mgd respectively. This plant discharges effluent to the Bitterroot River. Improvements have been proposed to increase the facilities capacity and water treatment efficacy. As development proceeds coordination with local utilities is encouraged. More detailed information on the Sanitary Sewer and Wastewater Treatment system can be found on the City of Hamilton website.

2.3.4 Electrical Utility Systems

The City of Hamilton currently has three transformers owned by the Northwester Energy Company supplying power to RML campus. The power substation owned by the Northwestern Energy Company (formerly The Montana Power Company) is a 12,470-volt, 20 Megavolt ampere (MVA) station that is loaded to approximately 12 MVA. There are two feeders serving RML, original and express. The "Original" feeder serves the community and RML. With the future expansion of the RML site, it was determined that an "Express" feeder was needed to handle the additional load and increase reliability. There is a project under construction called “Generator Relocation” ” which will improve the 12,470 volt distribution and emergency systems on campus.

2.3.5 Telecommunications and Network Systems

2.3.5.1 Telephone System

General telephone service is provided to the RML campus by CenturyLink via a 100-pair line and a T1 circuit. Services include ‘plain old telephone service’ (POTS) lines, central office trunks, and Direct Inward Dial (DID). The CenturyLink central office in Hamilton, Montana, is currently unable to directly provide ISDN PRI or BRI circuits due to the aged model of their main switch. Per CenturyLink Federal Services there are no plans to upgrade their equipment for the Bitterroot Valley. Limited services from the local CenturyLink office due to their outdated infrastructure may impact future telecommunications services at RML.

2.3.5.2 Network Systems

Primary wide area network connectivity to NIAID/Maryland, NIH and the internet is through a 10 GIG-E circuit currently hosted by Zayo and Level 3 Communications. In case of an outage on the primary 10 GIG-E circuit a secondary/failover DS3 circuit hosted by Verizon Business provides connectivity.

NIH/CIT provides a T1 circuit for connectivity to the Andover security access control system for the RML campus. Increasing implementation of networked security systems on the RML campus may initiate a requirements analysis for expanding the bandwidth of the NIH/CIT-provided circuit to support the NIH/ORS security systems.

2.3.6 Natural Gas Utility Service

The RML campus is currently served by four natural gas utility service lines per Northwestern Energy, the local natural gas utility company. Only one of these is a large industrial service. Three are smaller residential type services. The three smaller ¾” residential lines service three individual buildings on campus and each is fitted with a meter and service regulator. The large 6” industrial line services the reminder of the RML campus.

2.4 FIRE PROTECTION AND EMERGENCY SERVICES

Fire protection and emergency response services throughout Ravalli County are supplied by 12 local volunteer fire departments. These include the Corvallis Fire Department, Darby Fire Department, Florence Fire Department and Quick Response Unit, Hamilton Fire Department, Painted Rocks Fire and Quick Response Unit, Pinesdale Fire Department, Stevensville Fire Department, Stevensville Rural Fire Department, Sula Fire and Quick Response Unit, Three Mile Fire and Quick Response Unit, Victor Fire Department, and West Fork Fire Department and Quick Response Unit. The Hamilton Volunteer Fire Department is the primary emergency response for RML but, in the event of a major fire and emergency situations, these units utilize a mutual aid agreement to provide assistance to each other as required. During major fire and emergency situations that exceed the capacity of local departments and/or response units, the Ravalli County Disaster and Emergency Services (DES) Coordinator offers assistance in the definition of combined plans and actions.

2.5 LAW ENFORCEMENT

2.5.1 Ravalli County

The Ravalli County Sheriff's Office is primarily responsible for the investigation and enforcement of criminal and traffic laws throughout the county. However, these duties are concentrated outside the incorporated limits of towns and cities.

The Sheriff's Office serves as coroner and runs the county jail, which houses arrested persons for all law enforcement agencies in Ravalli County as well as for the U.S. Marshals, Federal Bureau of Investigations (FBI), Drug Enforcement Agency, law enforcement resources of the Immigration and Naturalization Service, and the Montana Highway Patrol.

2.5.2 City of Hamilton

The Hamilton Police Department has a total of 15 sworn officers, resulting in approximately 3.4 officers for every 1000 residents of the city. The rank structure includes the Chief of Police, the Police Lieutenant, Patrol Sergeant, two detectives, nine patrol officers and one animal control/parking enforcement officer. Service is provided 24 hours a day/seven days a week.

2.5.3 RML

The responsibility of the NIH Police is to protect people and property from the threat of terrorism, crime, or other hazards so the administration of the business and research of the NIH may progress as unimpeded as reasonable. The police accomplish this by conducting routine patrols, and by responding to and handling emergencies and other requests for service. The NIH Police enforce laws, investigate crimes, issue IDs and provide public services such as escorts and lock-out relief to those in need of assistance. The force utilizes crime prevention methods and techniques to reduce crime at the RML. They work to ensure the safe and efficient movement of traffic on the campus, investigate traffic accidents, and enforce traffic laws and parking regulations. The NIH Police conduct initial and follow-up investigations of all crimes committed against persons and property on the RML campus. The investigations include crime scene processing, interviewing victims and witnesses, arrests for prosecution and documentation of all activities. The NIH Police maintain a liaison with the FBI and all local law enforcement agencies. The NIH Police support the contract guard services by handling all incidents where law enforcement authority and expertise is needed. Contract guards at the RML provide patrols, escorts for visitors, and perimeter screening of persons and vehicles at the entrances.

2.6 COMMUNITY FACILITIES AND CULTURAL ASSETS

2.6.1 Museums, Theater and Historic Resources

Hamilton currently boasts two museums. In 1887, the wife of Marcus Daly, a copper mining magnate who developed the local timber industry to supply framing timbers to his mines, completed the Daly Mansion. The mansion was closed following Mrs. Daly's death in 1941 until 1987 when it was reopened to the public as a museum. The second museum, the Ravalli County Museum, is housed in the former Ravalli County Courthouse. This museum was built in 1900 and has, among other exhibits, the Ricketts Museum which commemorates the development of RML.

There are other cultural assets in the area as well. The Hamilton Players, a theater company, perform plays on a regular basis in the building that once housed the predecessor of RML. Also, the High School has a large performing arts facility. St. Mary's Mission, in nearby Stevensville, was the first permanent white settlement in Montana, founded by Jesuit priests in 1841, and nearby Fort Owen provides a glimpse of early life in the valley.

A portion of the RML Campus is part of a Historic Preservation District, listed on the National Register of Historic Places. The buildings included in this district are Buildings 8, 9, 11, the Quad and the recently acquired log home at 805 South 4th Street. These buildings date back to the beginning of the RML campus and care has been, and will continue to be, taken to preserve and renovate them while maintaining their historical integrity.

The adjacent Hamilton Southside Residential District was added to the National Register of Historic Places in 1988. This district includes portions the residential community to the north and east of the RML campus, and includes examples Queen Anne, Craftsman, Colonial Revival and Spanish Revival buildings.

2.6.2 The Bitterroot Library District

The Bitterroot Public Library in Hamilton was originally chartered under the authority of the Bitterroot Library District, and receives partial funding from both Ravalli County and the City of Hamilton through property tax mills.

The Library Board is comprised of residents who live throughout the Library District. The Board consists of five members: two each appointed by the city and county, and one that is appointed jointly by the city and county. This Board governs total operation of the Library and has the authority to make loans and grants.

2.6.3 Parks and Recreation

Recreational opportunities abound in Ravalli County. Hiking, horseback riding, mountain biking, downhill and cross-country skiing, snowmobiling, golf, hunting, fishing, wildlife photography, and soaking in a natural hot spring are among the many activities available. Community Theater, rodeos, county fair, and various bluegrass, arts, harvest and microbrew festivals occur throughout the year. The adjacent Selway-Bitterroot Federally Designated Wilderness Area to the west and the Anaconda-Pintler Federally Designated Wilderness Area to the southeast provide protected wilderness areas. Lewis and Clark expedition campsites and trails are scattered throughout the valley. The City of Hamilton website (www.cityofhamilton.net) shows five city-owned parks within the city, including Hieronymous Park, Claudia Driscoll Park, Legion Park, the Vester Wilson Athletic Fields, and River Park, a portion of which adjoins the RML property on its western boundary. These parks are shown on Exhibit 2-3.

2.6.4 Education

Public elementary and secondary education are part of Hamilton School District #3. It consists of three elementary schools, a middle school and a high school. The Bitterroot College of the University of Montana is opening in the Fall of 2015 in Hamilton. The University of Montana and Missoula Vocational Technical Center, both located in Missoula, 46 miles to the north, are other nearby centers of higher education.

2.6.5 Public Facilities

In addition to the assets listed above the City of Hamilton website includes a broad range of public facilities that contribute to the well-being of the community. These are included in Exhibit 2-3.

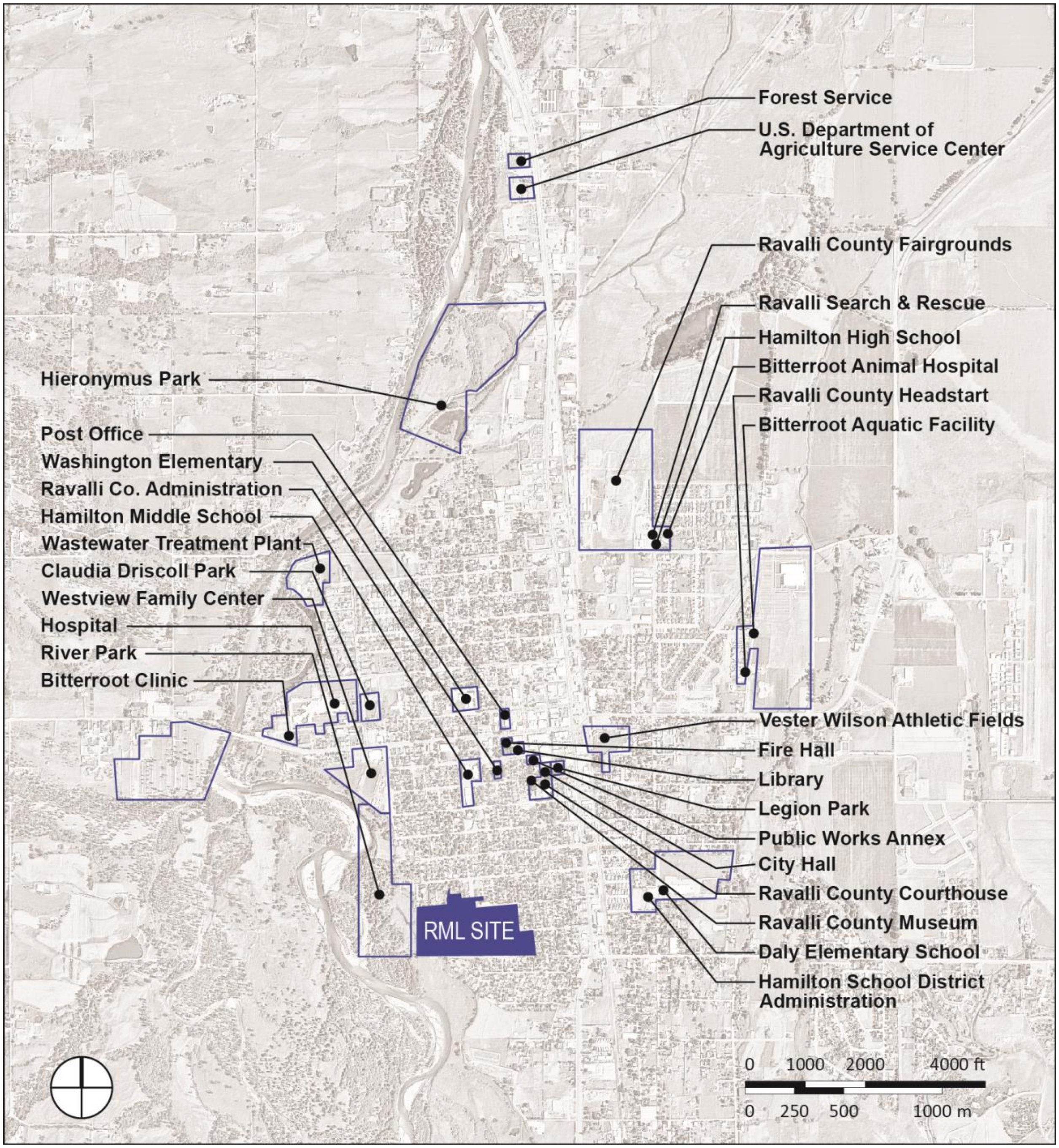

Exhibit 2-3: Community Facilities and Cultural Assets

2.7 POPULATION AND HOUSING

2.7.1 Ravalli County

Following is a summary of demographic statistics for Ravalli County and its principal communities according to the 2010 U.S. Census:

Exhibit 2-4: Demographic Statistic for Ravalli County

Community	Population	Households	Area (mile^2)	Persons per mile^2	Dwellings per mile^2
Hamilton	4,348	2,175	2.5	1,719	971
Stevensville	1,809	836	1.0	1,846	954
Corvallis	976	400	0.6	1,627	713
Pinesdale	917	178	1.3	705	149
Florence	765	299	0.8	956	390
Victor	745	327	0.5	1,490	714
Darby	720	303	0.6	1,241	621
Conner	216	90	1.8	120	61
Charlos Heights	120	49	1.2	100	50
Sula	37	17	3.3	11	7
Ravalli [county]	40,212	16,953	2,400	17	8

As of the 2010 Census, there were 40,212 people, 16,953 households, and 11,380 families residing in the county. The population density was 17/mi². There were 19,583 housing units at an average density of 8/mi². The racial makeup of the county was 95.9% White, 3.0% Hispanic or Latino of any race, 0.9% American Indian or Alaska Native, 0.5% Asian, 0.2% African American, 0.1% Native Hawaiian or Pacific Islander, 0.6% from other races, and 1.9% from two or more races. Projections released by the Montana Department of Commerce in 2013 show the county population reaching 45,186 by 2034.

Of the 16,953 households, 26.5% had children under the age of 18 living with them; 55.5% were husband-wife families; 7.7% had a female householder with no husband present; 3.9% had a male householder with no wife present; and 32.8% were non-families. Twenty-seven percent of all households were made up of individuals and 11.8% had someone living alone who was 65 years of age or older. The average household size was 2.35, and the average family size was 2.83.

In the county the age distribution was: 22.9% being under the age of 18; 6.1% were from 18 to 24 in age, 20.6% were from 25 to 44 old, 32.2% fell into the 45 to 64 age category; and 19.2% were 65 years of age or older. The median age was 46 years. For every 100 females there were 98.6 males. For every 100 females age 18 and over, there were 95.9 males age 18 and over.

According to the 2008-2012 American Community Survey, the median income for a household in the county was $40,525, and the median income for a family was $55,394. Male full-time year-round workers had a median income of $41,257 versus $29,943 for females. The per capita income for the county was $23,636. The survey found that 14.6% of the population and 10.2% of families were below the poverty line; 21.9% of those under the age of 18 and 4.8% of those 65 and older were living below the poverty line.

2.7.2 Adjacent Counties

The following table compares Ravalli County with its adjacent counties, the most economically significant of which is Missoula to the north:

Exhibit 2-5: 2010 Census of Ravalli County and Adjacent Counties

County	Population	Households	Area (mile^2)	Persons per mile^2	Dwellings per mile^2
Ravalli	40,212	16,953	2,400	17	8
Missoula	109,299	45,926	2,618	42	19
Beaverhead	9,246	4,014	5,572	2	1
Granite	3,079	1,417	1,733	2	2
Idaho, ID	16,267	6,834	8,485	2	1
Lemhi, ID	7,936	3,576	4,570	2	1
Montana [state]	989,415	409,607	147,165	7	3

2.7.3 City of Hamilton

As of the 2010 census, there were 4,348 people, 2,175 households, and 1,006 families residing in the city. The population density was 1,719/mi^2. There were 2,456 housing units at an average density of 971/mi^2. The racial makeup of the city was 95.0% White, 0.6% American Indian or Alaska Native, 1.4% Asian, 0.3% African American, 0% Native Hawaiian or Pacific Islander, 0.2% from other races, and 2.5% from two or more races. Approximately 3.1% of the population was Hispanic or Latino of any race.

There were 2,175 households out of which 23.6% had children under the age of 18 living with them, 30.6% were husband-wife families, 11.7% had a female householder with no husband present, 3.9% had a male householder with no wife present, and 53.7% were non-families. Forty-seven percent of all households were made up of individuals and 35.8% had someone living alone who was 65 years of age or older. The average household size was 1.92, and the average family size was 2.72.

In the city the age distribution was: 21.1% under the age of 18; 7.4% were from 18 to 24 in age; 24.2% ranged in age from 25 to 44; 23.4% reported ages from 45 to 64; and 24.7% were 65 years of age or older. The median age was 43 years. For every 100 females there were 87.3 males. For every 100 females age 18 and over, there were 79.6 males age 18 and over.

According to the 2008-2012 American Community Survey, the median income for a household in the city was $25,167, and the median income for a family was $38,343. Male full-time year-round workers had a median income of $38,158 versus $28,047 for females. The per capita income for the city was $17,763. The survey found that 27.4% of the population and 23.1% of families were living below the poverty line while 46.3% of those under the age of 18 and 4.7% of those 65 and older were below the poverty line.

2.8 ECONOMY

2.8.1 Regional Economic Conditions

The most recent Ravalli County Economic Needs Assessment, 2002, makes the following points about the local economy:

2.8.1.1 Key Area Conditions & Trends

The single greatest force in the Ravalli County area's recent and on-going economic change is relatively high rates of people moving into the area and population growth. In fact, about 95% of the recent population growth is attributable to much higher rates of net in-migration to the county. Ravalli County's in-migration and population growth is spurring employment growth at a relatively high rate. Total personal income is rising fairly rapidly as well. However, these high levels of "quantitative" growth are not translating directly into significant improvements in the "quality" of economic life for many Ravalli County citizens.

As the population grows, it is also aging. The principal areas of population growth are among teenagers and persons in their 40s and 50s. Generally these age shifts are consistent with what is happening in the U.S. population as a whole, but also are caused by the net in-migration and age of new residents.

The economy of the Bitterroot Valley has become increasingly “growth driven” and “growth dependent”, with much of the employment and income growth associated with more people moving to the area and with heightened levels of construction activity.

2.8.1.2 Key Area Assets

The following are considered to be current and potential key economic assets of Ravalli County and the City of Hamilton:

- Natural setting and attendant recreation-tourism based businesses;
- Proximity to Missoula, a large and growing regional center;
- The presence of a highly adaptive wood products industry;
- The presence of RML, an NIH research lab and GlaxoSmithKline Corporation, a biomedical research facility;
- The long-standing presence and area relationship with the U.S. Forest Service;
- Matured and experienced work force;
- Proximity to the University of Montana and the College of Technology in Missoula;
- High level of area self-employment;
- Area farmers and ranchers;
- Scheduled improvement and capacity expansion of Route 93.

2.8.2 Rocky Mountain Laboratories Contribution to the Economy

An Economic Fact Sheet developed by RML states that for every 100 jobs at RML, approximately an additional 40 jobs in other parts of the Montana economy are affected, including fractional jobs. The total employment multiplier is therefore 1.4 or a total of 140 jobs including the original 100. (*1—Phil Brooks, Ph.D., Chief Economist, Montana Dept. of Labor and Industry. November 2003)*

The following economic data from RML are approximate, but indicate the impact of RML on the economy:

- The largest segment affected is retail trade (spending by employees at RML plus employees in other affected sectors) at roughly 22.5 of the 100 jobs. Health services are another 10 jobs; finance, insurance, and real estate sectors combined are an additional 10 jobs, split between serving businesses and consumers. Another 37.5 jobs are scattered primarily among other consumer services sectors.
- For every $1 million in employee compensation at RML (payroll + fringe benefits), roughly an additional $600,000 of employee compensation is generated in other parts of the Montana economy. The total employee compensation multiplier is therefore about 1.6. (*2—Brooks*)

- At the present the RML payroll of $10.4 million, therefore impacts another $6.24 million in the Montana economy.
- The same segments of the Montana economy that were prominent in the employment impact analysis above are also prominent for employee compensation. Of the $6.24 million generated by RML, about $1.25 million is in retail trade, $1.15 million in health services (health services wages and salaries are much higher than for retail trade), and $624,000 in finance, insurance, and real estate combined.
- The present average annual salary at RML is $41,600, based on 250 workers and an annual payroll of $10.4 million for 2003. The report projected that when the proposed IRF was built, the average annual salary at RML would be $48,571, based on 350 workers and an annual payroll of $17 million. (*3-- RML Administrative and Facilities Management Section. November 2003)*
- RML is included in a list of seven Montana research facilities that are considered vital to establish a "life sciences" economic development cluster in Montana. (*4—"Montana Industry Cluster Analysis", pp. 37-43. by Regional Technology Strategies, Inc. May 2003)*
- Analysis indicates that, "The research infrastructure is concentrated in the west (Missoula, Hamilton). … Establishment concentrations in the biotechnology core are above average in western Montana and almost twice the national average in the southwest. Employment concentrations are below average even in these regions, indicating that Montana's biotechnology cluster consists primarily of small companies. This suggests some promising entrepreneurial activity."
- The analysis further states, "Recruitment does not appear to be a problem. There are an adequate number of potential candidates for highly specialized or skilled positions who would like to move to Montana. . . . There is also an adequate supply of entry-level candidates, because large percentages of recent graduates with life science-related degrees seek to remain in Montana."
- RML is cited in an economic research document as having an important role in the Bitterroot Valley's future. (*5--2002 Ravalli County Needs Assessment, p. c. Dr. Larry D. Swanson, University of Montana. November 2002)*

In 2012, Patrick M. Barkey, the Director of the Bureau of Buisiness & Economic Research (BBER) from the University of Montana completed a study of the Economic Contribution of Rocky Mountain Laboratories to the regional and state economy. The BBER research addresses the question: What would the Montana economy look like if RML did not exist? They used a respected economic model (REMI) to project how the economy would look minus the RML activities.

The Conclusion of the BBER study were that operations of RML produce a significant impact on the state economy including almost 1,100 jobs, $92.2 million in income, and nearly 2,000 people residing in the state. The jobs are spread across wide spectrum of the economy. The impacts of RML on the economy are permanent and recurring every year that RML operates.

2.9 OTHER RELEVANT FEDERAL FACILITIES IN THE REGION

2.9.1 USDA U.S. Forest Service

2.9.1.1 Northern Region – Missoula Office of the Regional Forester

The Northern Region National Forest lands encompass 25 million acres and are spread over five states. Included are 12 national forests located within the perimeter of northeastern Washington, northern Idaho, and Montana; and the National Grasslands in North Dakota and northwestern South Dakota.

2.9.1.2 Bitterroot National Forest – Hamilton Office of the Forest Ranger

The Bitterroot National Forest consists of 1.6 million acres of forest in southwest Montana and Idaho. Half of the forest is dedicated to the largest expanse of continuous pristine wilderness in the lower 48 states -- the Selway Bitterroot, Frank Church River of No Return, and the Anaconda Pintler. Much of its beauty can be attributed to the heavily glaciated, rugged peaks of the Bitterroot Range. Drainages carved by glaciers form steep canyons that open into the valley floor.

2.9.2 Federal Bureau of Investigation

The Missoula Office of the FBI is under the jurisdiction of the Salt Lake City, UT Field Office, and is responsible for Covering Deer Lodge, Granite, Lake, Mineral, Missoula, Ravalli and Sanders counties.

2.10 COORDINATION WITH LOCAL PLANNING AGENCIES

The planning agency with jurisdiction over the Ravalli County area is the Ravalli County Planning Board. Representatives of the RML have been in frequent communication with the county staff and the Hamilton City Planning Board staff over the years.

3 BASELINE CONDITIONS ON THE RML CAMPUS

As noted in Chapter 1, the Master Plan is based on data and conditions existing in calendar year 2014. This date is the baseline for the personnel and space projections in the plan, as well as for cataloging campus conditions. Unless otherwise noted, all information in this chapter is from baseline year 2014.

3.1 SITE OVERVIEW

3.1.1 Site Size and Condition

The Rocky Mountain Laboratories (RML) is approximately 36.6 acres in size and located in the southern portion of the City of Hamilton. The principal borders of the property are as follows:

- North – Baker Street, residential streets and properties, and a parcel belonging to the Hamilton School District no. 3 which contains a senior citizens' recreation center.
- East – 4th Street with single-family residences opposite the RML property, and an alleyway serving the residential area.
- South – The boundary between the City of Hamilton and surrounding Ravalli County. This area is a single-family residential neighborhood with yards, driveways, alleyways and miscellaneous structures abutting the RML property line and fence.
- West – The Bitterroot River, its floodplain and wetlands. The area is also part of a contiguous River Park belonging to the city.

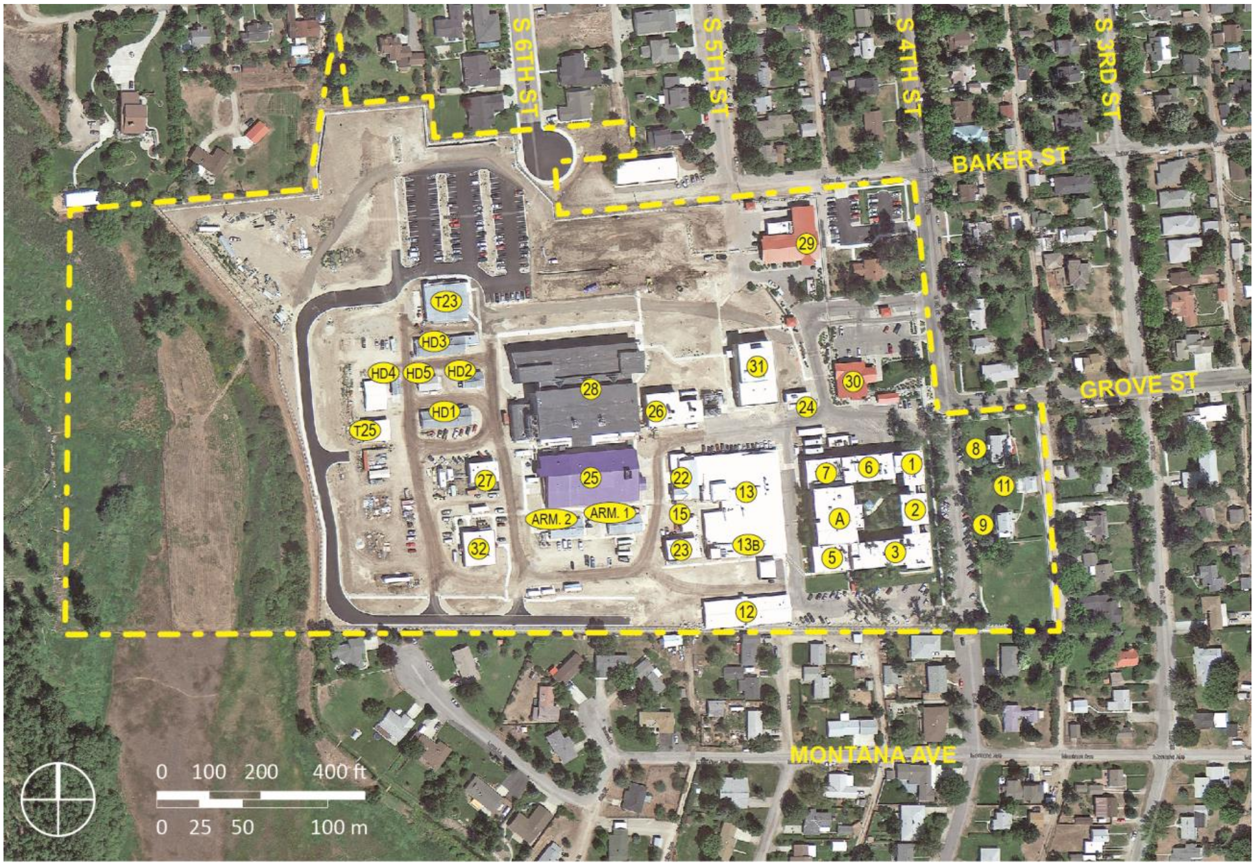

Exhibit 3-1: Aerial Photo with Building Numbers

The site is of diverse character with buildings that vary in size, style, and materials. Two Colonial Revival, two-story, wooden, residential clapboard sided buildings are located in a park-like setting in the southeast corner of the site separated from the rest of the campus by the 4th Street extension. Visible from the 4th and Grove Streets intersection is a cluster of laboratory buildings ranging in height from two to four stories and consisting of campus Buildings A, 1, 2, 3, 5, 6 and 7. This red brick Collegiate Gothic-style complex is known as the Quad. Two new, one-story, vaguely Craftsmen Bungalow inspired stone, timber and stucco structures that serve as Building 30 (the Visitors' Center) and Building 29 (the Shipping and Receiving Building) and the newly acquired historic log home at 805 South 4th Street complete the perimeter buildings in the northeast corner of the site. At the center of the site is Building 28, a new, three story glass and masonry laboratory building that dominates the site. This building is also known as the Integrated Research Facility, or IRF. On the rest of the site are various one-story, split-faced masonry and metal utilitarian buildings with above-ground utilities and support structures.

The appearance is somewhat industrial, and there is little or no sense of cohesion or order other than the comparatively tranquil southeast corner of the site.

3.1.2 Land and Building Use

The site has seven categories of building use:

- Laboratory (primarily laboratories, researchers' offices and support space)
- Animal
- Administration
- Service
- Utility (including boiler and refrigeration plants, emergency power, switchgear, etc.)
- Public safety
- Vacant

These functions are somewhat scattered, but the research is generally in the Quad (Buildings A, 1, 2, 3, 5, 6 and 7), Building 25, Building 28, and portions of the single-story utilitarian buildings adjacent to these main research buildings. Animals are housed primarily in Buildings 13 and 25, 32 and portions of Building 28. Administration is located in portions of the Quad and in Buildings 30 and 31. The Utility and service buildings are scattered throughout the campus. The utility buildings function as support buildings of various kinds and/or mechanical/electrical equipment. The vacant buildings are residential buildings that would need renovations and security upgrades to house administrative functions. The campus buildings and functions are summarized in Exhibit 3-2 and Exhibit 3-3.

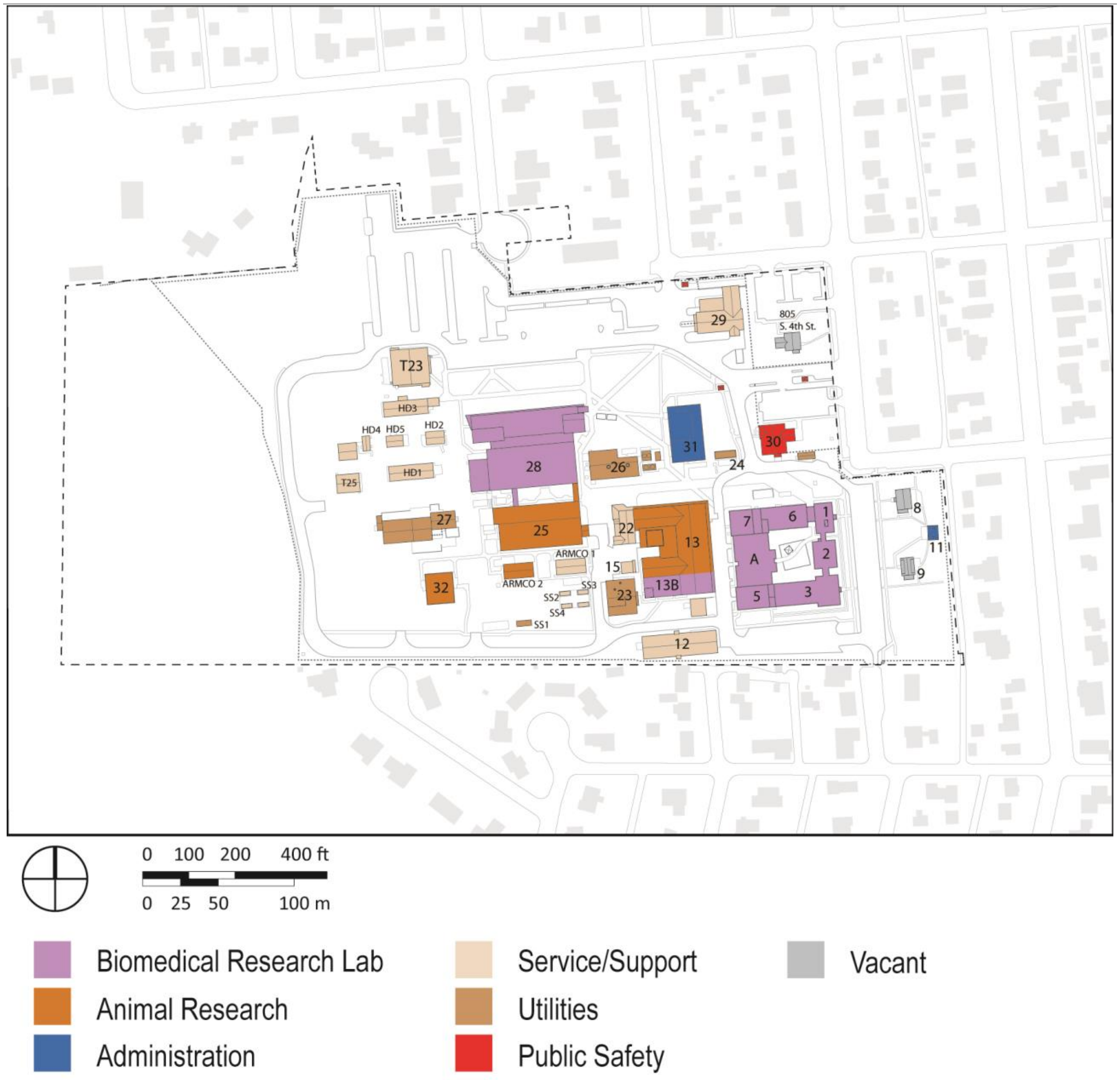

Exhibit 3-2: Existing Building Use

Exhibit 3-3: Building Use Table

Building Name	Predominant Use Type	Gross SF.	Notes
RML 01	Lab	8,246	The Laboratory Quad
RML 02	Lab	9,468	The Laboratory Quad
RML 03	Lab	24,814	The Laboratory Quad
RML 05	Lab	7,224	The Laboratory Quad
RML 06	Lab	15,000	The Laboratory Quad
RML 07	Lab	3,975	The Laboratory Quad
RML 08	Vacant	4,461	Vacant due to security concerns
RML 09	Vacant	3,156	Vacant due to security concerns
RML A	Lab Support	24,929	The Laboratory Quad utility, mechanical space and shared laboratory support
RML 11	Admin	660	Used for contract support services due to security concerns
RML 12	Lab Support	7,690	Freezer Storage, Medical Arts, Laboratory Training area
RML 13	Animal	17,800	
RML 13B	Lab	5,880	
RML 15	Storage	1,092	Radiological Storage
RML 22	Storage	2,624	Waste Marshalling/ Recycling Facility
RML 23	Utility	4,712	Incinerator with scrubber
RML 24	Utility	700	CCR Emergency Generator
RML 25	Lab - Animal	33,900	High Containment Laboratory, Vivarium and Shared Laboratory Support
RML 26	Utility	5,664	Central Boiler Plant
RML 27	Utility	1,961	Emergency Generator
RML 28	Lab - Animal	111,590	High Containment Laboratory, Vivarium and Shared Laboratory Support
RML 29	Service	7,525	Shipping and Receiving
RML 30	Public Safety	3,562	Visitor's Center
RML 31	Admin	29,695	Admin, Computational Center and the Research Technology Unit Genomics
RML 32	Animal	4,020	
RML HD1	Service	3,072	Maintenance Shops and Storage

Building Name	Predominant Use Type	Gross SF.	Notes
RML HD2	Service	1,120	Maintenance Shops and Storage
RML HD3	Service	3,482	Maintenance Shops and Storage
RML HD4	Service	512	Maintenance Shops and Storage
RML HD5	Service	864	Maintenance Shops and Storage
RML SS1	Storage	476	Chemical and Hazardous Material Storage
RML SS2	Storage	476	Chemical and Hazardous Material Storage
RML SS3	Storage	476	Chemical and Hazardous Material Storage
RML SS4	Storage	476	Chemical and Hazardous Material Storage
RML T23	Admin	4,908	ORF and ORS Police Offices
RML T25	Storage	2,000	Equipment Storage
RML ARMCO-1	Storage	2,048	Veterinary Branch Equipment Storage
RML ARMCO-2	Animal	2,048	Vivarium
CONEX	Storage	1,448	Equipment Storage
805 South 4th St.	Vacant	1,867	Vacant

Most of the land area that is not dedicated to structures is devoted to paved and unpaved parking and circulation paths. Refer to Exhibit 3-4 for a summary of pervious and impervious areas. Also see Exhibit 3-5.

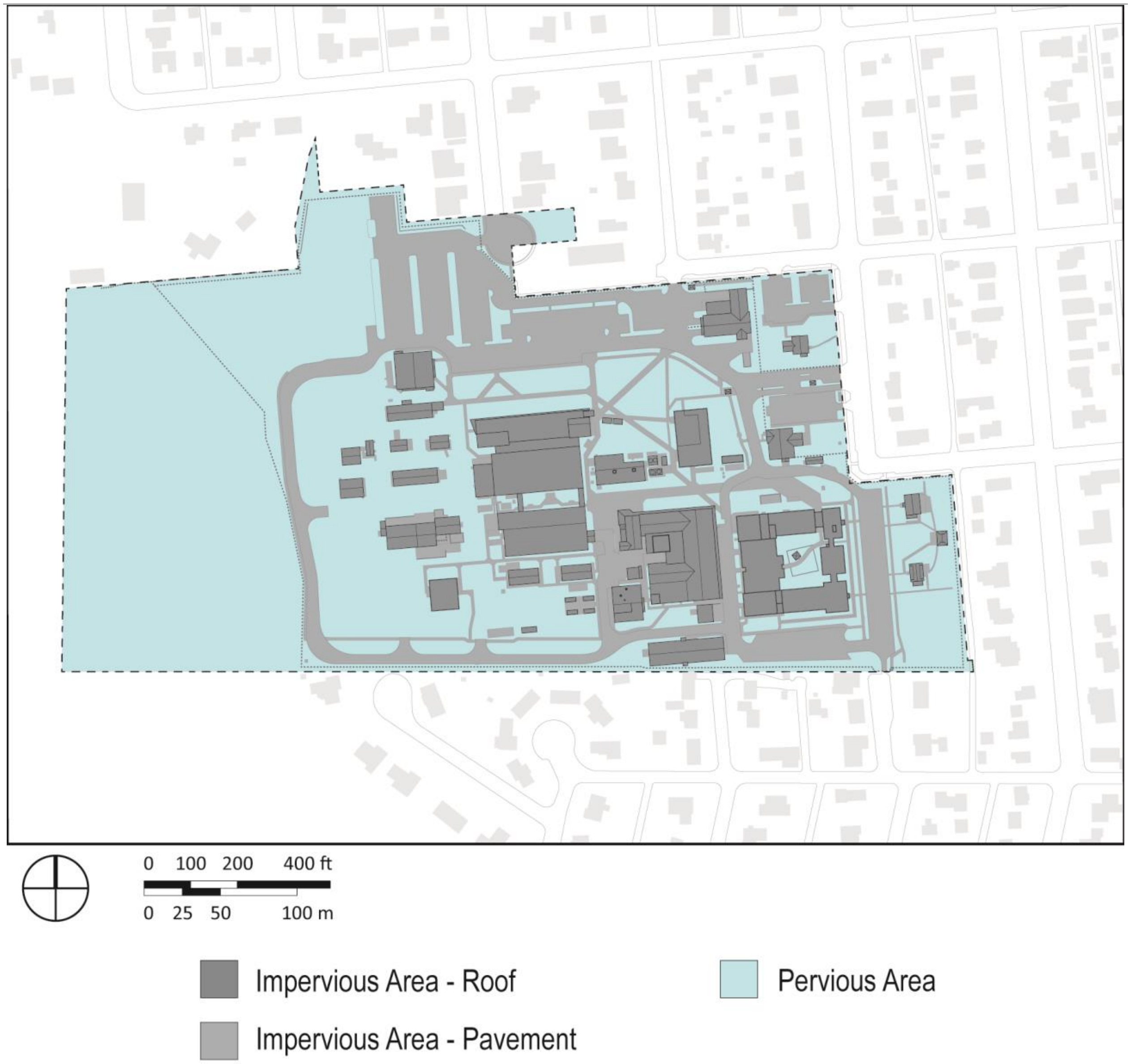

Exhibit 3-4: Pervious and Impervious Areas

Exhibit 3-5: Baseline Land Areas Table

Category	Acres	% of Site
TOTAL SITE AREA	36.6	100
Total Pervious Area	22.9	63
Total Impervious Area	13.6	37
Roof (horizontal projection)	4.9	13
Pavement	8.7	24

3.1.3 Density

The density of the site is approximately equivalent to a Floor Area Ratio (FAR) of 0.2, with a building coverage of 13% and impervious (lot) coverage of 37%. The only comparable density in the Hamilton Zoning Ordinance allows 70% lot coverage at three stories for Industrial and Commercial Manufacturing uses. This would yield a FAR of 2.1.

The tallest building on the RML campus is Building 28 at 52 feet, slightly higher than the highest portion of the historic Quad (Building A) at 50 feet. The Hamilton Zoning Ordinance restricts most zones to a maximum of 45 feet or three stories, though no height is specified for the Public Institutional zone (in which RML is located) or for the adjacent Single-Family Residential zone. Being a federal agency, the NIH is exempt from local zoning ordinances; however NIH will develop sites and buildings consistent with local agencies' zoning and land use policies and development, redevelopment, or conservation objectives, to the maximum extent feasible in support of respecting local community built environment guidelines.

The campus population density is about 10.5 persons per acre when all employees are present, compared to a density of about 12 persons per acre permitted by the City of Hamilton's Zoning Ordinance for a Single-Family Residential zone (such as the neighborhood to the immediate north). In the Single-Family Residential zone, 7,000 square foot minimum lots would yield about six houses per acre and the average household size of 2.00 persons per dwelling unit for Hamilton in the 2010 Census would result in about 12 persons per acre.

3.1.4 Circulation

The entrances to the RML campus are clear and few in number. The main entrance from 4th Street is used by staff. The entry at the intersection of 5th Street and Baker Street is for delivery vehicles.

The gate at 6th Street is used on the infrequent occasion when a secondary means of entry or egress is required.

Visitor vehicle parking is limited to a visitor parking lot clearly demarcated and located outside the secure perimeter at 4th and Baker. Similarly, commercial delivery vehicles are generally restricted to the service yard immediately inside the gate at Baker and 5th Street and the loading bays for the Shipping and Receiving Building. Some service vehicles belonging to contractors, suppliers, vendors, and the like, are permitted direct access to destinations on campus after security screening.

The newly constructed perimeter circulation road and vehicle barriers improve the division between pedestrians and vehicles and employee parking from service and delivery vehicle access. For employees, vehicle circulation onsite is limited to the eastern portion of the campus from the main entrance to the employee parking lots to the north or around the Quad. Gates control access to the service roads to the west and south of the campus. Access is limited to maintenance and security traffic or service and delivery vehicles escorted by NIH staff.

Due to the scattered location of the facilities on the campus, coupled with the multiple entrances and service areas, buildings are virtually surrounded by pavement or gravel drives which are shared by all modes of circulation – vehicular, pedestrian and bicycle.

3.1.4.1 *Campus Entries*

The quality and character of entries onto the RML campus create an important arrival image for employees as well as visitors. Campus entries also act as key orientation points for understanding the organization of the entire site. The main campus entries, at 4th and Grove Streets and 5th and Baker Streets, despite limited landscaping and undistinguished architectural features, are obvious because of the gates and guardhouses present at these locations. Staff and visiting motorists, bicyclists, and pedestrians enter at 4th Street. There is a pedestrian/bicycle sally port through the fence at the south end of 4th Street. Commercial delivery and service vehicles access the campus from Baker and 5th Streets, as shown in Exhibit 3-6. The 4th Street entrance is further set apart as the main campus by the prominent gate arrangement and width. By contrast, the second entrance has few distinguishing features. The remainder of the site perimeter is enclosed by a security fence.

1 Commercial Vehicle Entry
2 Employee Vehicle Entry
3 Employee and Public Pedestrian Entry (Visitor Center)
4 Employee Pedestrian Entry

Exhibit 3-6: Campus Entries

3.1.4.2 *Parking*

A new staff parking lot was constructed in accordance with the 2009 Master Plan. This lot, on the northern portion of the campus, can accommodate 164 vehicles plus 6 handicap parking spaces. The staff parking near the Visitor Center has 24 spaces plus 2 handicap. The staff parking around the Quad provides 85 parking spaces plus 4 handicap. There is parking for visitors in the lot at the corner of Baker and 4th Street. This lot has 25 spaces plus 2 handicap.

3.1.4.3 *Access for Persons with Disabilities*

Existing buildings on the RML campus are required to meet the criteria of the Architectural Barriers Act Accessibility Standard, defined as Appendices C and D, 36 CFR 1191, ABA Chapters 1 and 2, and Chapters 3 through 10.

3.2 NATURAL FEATURES

The RML property is mostly flat, with an elevation of 3,585 feet above sea level (asl) at its eastern end along 4th Street, and sloping to 3,580 feet asl at the western end before descending to the floodplain, wetlands and river which are at 3,557 feet.

3.2.1 Floodplain

The west end of the RML property is in the Bitterroot River floodplain, which lies at approximately 3,563 feet asl (Refer to Exhibit 3-7**Error! Reference source not found.**). Floodplains, such as the far western end of the RML site, are areas of relatively flat land bordering a river that are typically inundated fully and partially when the river floods. Floodplains are formed by fluvial erosion and deposition of sediment during floods. The extent of floodplain inundation depends in part on the magnitude of the flood, defined by the return period. Federal policy governing construction within floodplains is as follows:

Executive Order 11988 requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

EO 11988 regarding flood risk management has recently been amended by EO 13690 to Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input.

There are no RML facilities located within the property floodplain area. Master Planning has taken these EO into consideration as new facilities are proposed. Further study of the impact of the proposed facilities will need to be evaluated if funding for design and construction becomes available.

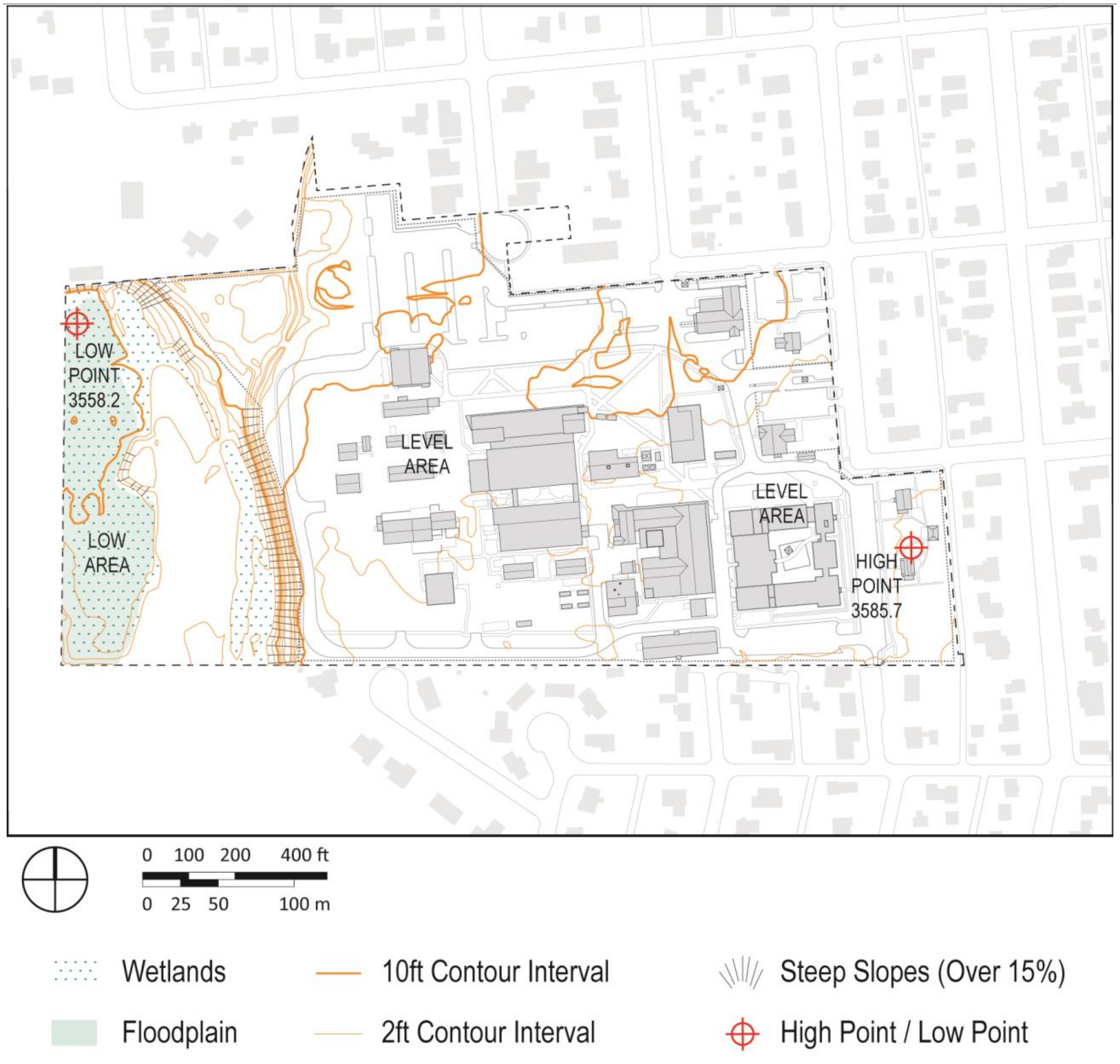

Exhibit 3-7: Natural Features

3.2.2 Wetlands

The west end of the RML property is in the wetlands of the Bitterroot River. The far west portion of the property is a designated flood plain (Refer to Exhibit 3-7). Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (Cowardin, December 1979).

Protection of the nation's wetlands is provided under Section 404 of the Clean Water Act. For regulatory purposes under the Clean Water Act, the term "wetlands" means:

"those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." [EPA Regulations 40 CFR 230.3(t)].

The basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment or (2) the nation's waters would be significantly degraded. In other words, when an applicant applies for a permit, he must show that he has, to the extent practicable:

- Taken steps to avoid wetland impacts;
- Minimized potential impacts on wetlands; and
- Provided compensation for any remaining unavoidable impacts.

Minor road activities, utility line backfill, and bedding are activities that can be considered for a general permit. States also have a role in Section 404 decisions through State program general permits, water quality certification, or program assumption.

3.2.3 Geology

The Bitterroot Valley is a north-south trending intermountain basin about seven miles wide and 64 miles long, encompassing about 430 square miles. The Bitterroot Valley and Bitter Root Range varies in elevation from approximately 7,014 feet above sea level at the Lost trail Pass to 3,250 feet at its termination at the Missoula Valley. It is bounded by the Bitterroot Mountains on the south and west, the Sapphire Mountains on the east, the Anaconda-Pintler Mountain range on the southeast, and the Missoula/Clark Fork Valley on the north. The Bitterroot Valley is characterized by two topographic features: a broad one to two-mile wide floodplain in the center of the basin; and high, broad alluvial/colluvial terraces on the east and west flanks that are on average two to three miles wide. The terraces slope from 4º to 5º on the basin edges to less than 1º near the Bitterroot floodplain. West side terraces slope gently and merge with the floodplain and are bisected by small drainages. East side terraces have generally smooth topography, are flat topped, and relatively steep escarpments ranging 50 to 150 feet above the floodplain (Kendy and Tresch 1996).

3.2.3.1 *Geologic Structure and Seismicity*

The Bitterroot Valley is a structural basin formed during the emplacement of the Idaho Batholith in the late Cretaceous or early Tertiary Period resulting from basin floor dropping along pre-existing faults (McMurtrey et al. 1972) or as a result of eastward block displacement of crustal material along low-angle thrust faults (Hyndman *et al.* 1975). Geophysical data indicate that the western valley margin is relatively straight, but the eastern side has an irregular margin (Noble *et al*. 1982). The structural depth of the basin is one mile (Lankston 1975). Lower Tertiary age sediments within the basin have been deformed into a faulted syncline, whereas Pliocene sediments are relatively undisturbed (McMurtrey *et al*. 1972), indicating that the major tectonic events that formed the Bitterroot basin have slowed considerably since the end of the Tertiary period. The basin is on the western edge of a broad region of basin and range tectonism. Extensional tectonism in the Bitterroot Valley, relatively dormant at present, occurs along existing fractures which are part of a regional northeast, northwest, and north-south trending fault system that exhibit long histories of recurrent activity (Barkman 1984).

At least six Class A faults or fault systems have been identified within 100 miles of the Hamilton area in western Montana (Haller et al. 2000). The closest Class A fault to Hamilton is the Bitterroot Fault, which runs along the east flank of the Bitterroot Mountains for a distance of approximately 60 miles and dips 45° to 90° east (Lindgren 1904, McMurtrey *et al*. 1972). The age of the faults extends from Cenozoic into late Quaternary time, with the most recent deformation occurring in pre-Bull Lake and Bull Lake glacial deposits, 300,000 to 130,000 years ago (Barkman 1984). The surface traces of the Bitterroot Fault system are shown by McMurtrey *et al*. (1972) as four traces that run along and into the Bitterroot Range from near Florence to south of Victor. Barkman (1984) identified several distinct fault scarps in the Bitterroot Valley that have been active in Quaternary time: the Bear Creek Scarp and the Curlew Fault located west of Victor, and the Tin Cup and Como Scarps located north of Tin Cup Creek. The most recent faulting appears to have occurred around 7,700 years ago on the Mission Valley section of the Mission Fault. Class A faults have evidence that at least one large-magnitude earthquake occurred on that fault during the last two million years. Within the last 40 years, two recordable earthquakes greater than 2.5 Richter magnitude have occurred within 50 miles of Hamilton. In 1982, a 2.5 Richter magnitude tremor occurred approximately 20 miles southeast of Hamilton (Stickney et al. 2000), and on June 28, 2000, a 4.5 magnitude earthquake occurred approximately 40 miles northeast of Hamilton.

The Bitterroot Valley has one of the lowest seismic activity ratings in western Montana (Stickney *et al*. 2000). The International Conference of Building Officials (ICBO) rates Hamilton as a low seismic risk area (Zone 0). By comparison, Salt Lake City is in Zone 2, and part of San Francisco is in Zone 4.

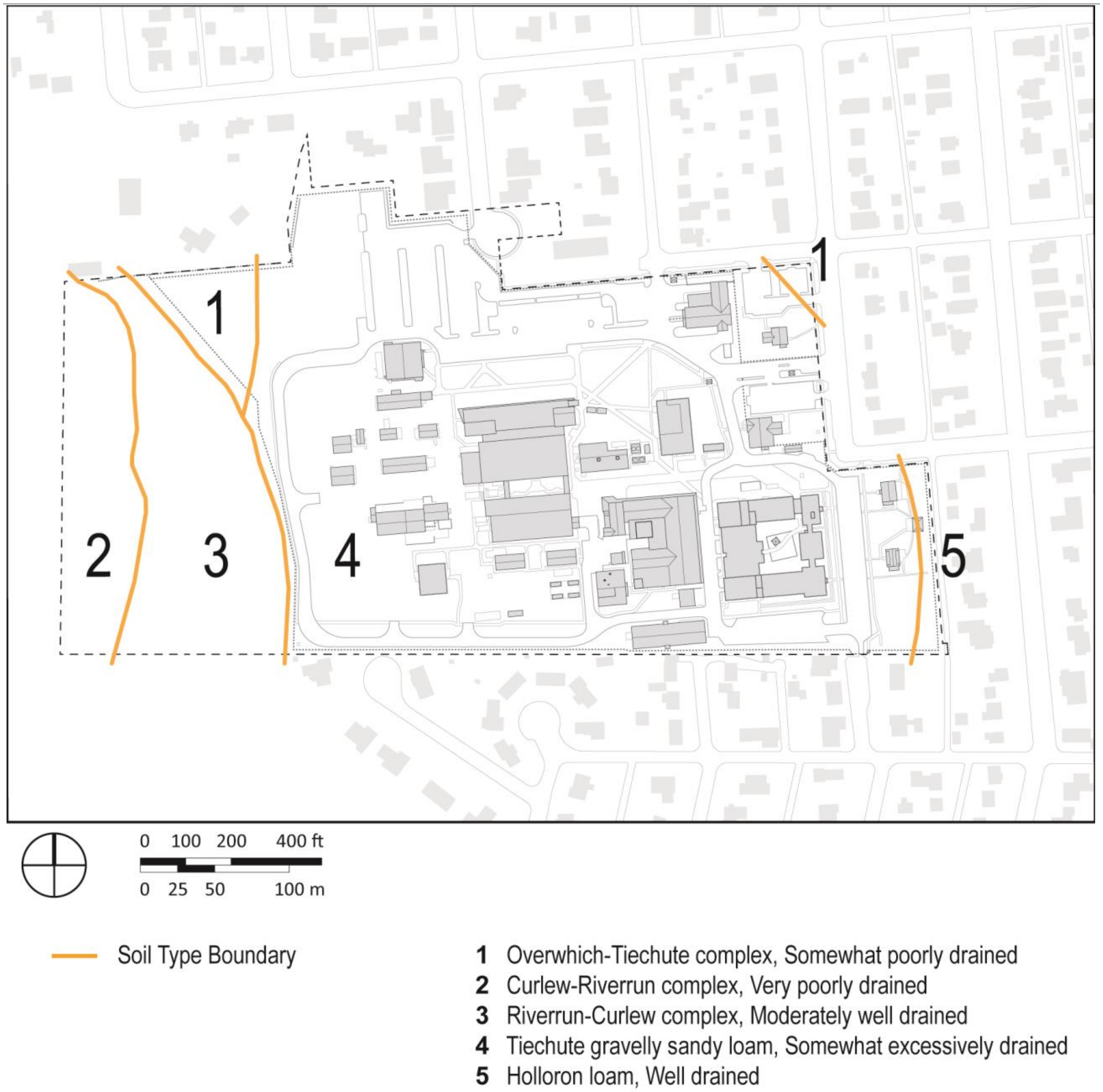

Exhibit 3-8: Existing Subsurface Soils

3.2.4 Vegetation and Ground Cover

In 2009 vegetation within the RML campus consisted of sparse lawn grasses and weeds competing with pavement, buildings and pebbly bare earth (see Exhibit 3-9), except for the southeast corner of the property where some mature trees stand between the east side of the Quad (Buildings 1, 2 and 3) and the existing historic houses (Buildings 8 and 9) along the parking lot which was formerly the right-of-way for 4th Street. A mixture of coniferous and deciduous trees (including elms) in varying states of health characterize the site in this area. The grass lawns in this area are also maintained in distinct contrast to the remainder of the site. However, in recent years significant landscape improvements have been implemented. The portions of the campus near the perimeter, north of Buildings 28 and 31 are landscaped with some lawn areas and some native grass areas with shrubs, trees and mulch intermixed. The old diseased trees have been removed and new trees planted. The new landscaping and new campus wide irrigation system were installed in 2014, as shown in Exhibit 3-10.

Exhibit 3-9: Photograph of lawn and parking area on northern portion of Campus (2009)

Exhibit 3-10: Photograph of lawn and parking area on northern portion of Campus (2014)

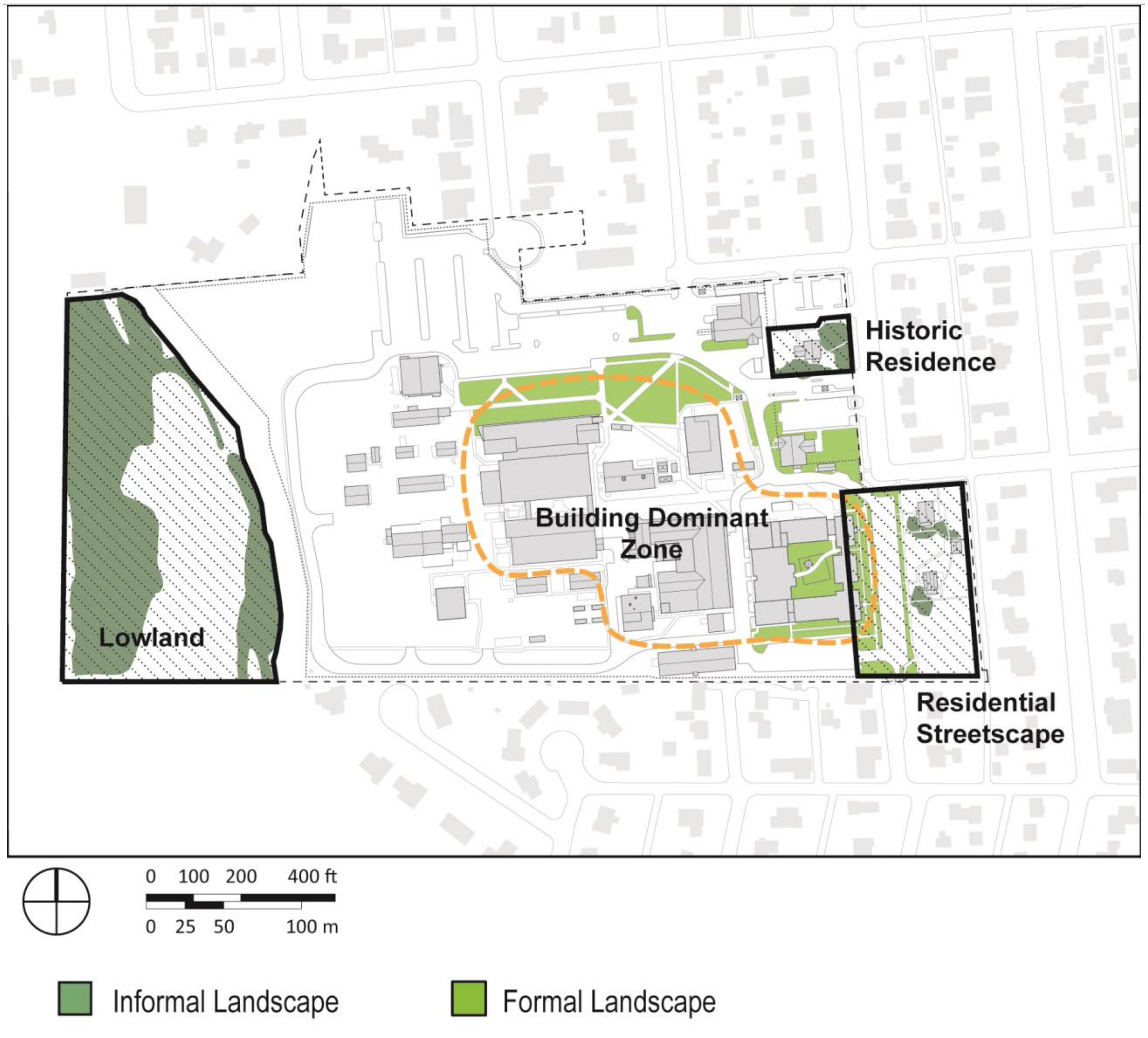

Exhibit 3-11: Existing Landscape Characteristics

3.2.5 Fish and Wildlife

In the vicinity of Hamilton, the Bitterroot River provides a variety of game fish, including: bull trout, brook trout, brown trout, rainbow trout, west slope cutthroat trout, and mountain whitefish. Brook, brown, and rainbow trout are not native to the Bitterroot River. Because of the abundant fishing, the river is one of the regional recreational attractions.

The fauna of the valley near Hamilton is characteristic of the northern Rocky Mountains. Many species of mammals, amphibians, and reptiles may occur in the vicinity of Hamilton and RML. Also, a wide variety of birds breed in the valley near Hamilton. Wildlife habitat has generally been altered by agriculture and other human developments. Highly altered urban environments meet the habitat needs of fewer species, most of which tend to be generalists, and several of which are non-native (e.g., European starling, house mouse, eastern fox squirrel). Species inhabiting urban environments tend to be tolerant of disturbance. Common species of mammals that occur in or adjacent to Hamilton include white-tailed deer, mule deer, coyote, red fox, striped skunk, raccoon, badger, long-tailed weasel, deer mouse, house mouse, meadow vole, Columbian ground squirrel, yellow-bellied marmot, eastern fox squirrel, several species of bats (e.g., big brown bat), and shrews (e.g., masked shrew). Terrestrial garter snakes, common garter snakes, and gopher snakes are known to live in Hamilton. Common bird species likely to breed in the urban habitats of Hamilton include rock dove, mourning dove, great horned owl, downy woodpecker, hairy woodpecker, northern flicker, western wood-pewee, eastern kingbird, tree swallow, barn swallow, black-billed magpie, black-capped chickadee, house wren, American robin, European starling, warbling vireo, yellow warbler, western tanager, American tree sparrow, chipping sparrow, dark-eyed junco, brown-headed cowbird, house finch, American goldfinch, and house sparrow.

3.3 BUILT ENVIRONMENT

3.3.1 Site Organization

The RML site is organized in an orthogonal grid pattern which parallels the surrounding Hamilton streets and is most apparent around the Quad. More recently, Building 28, located in the approximate center of the site, provides a new focus visually since it is the largest and tallest building on the campus at a height of 52 feet.

This building and Building 29, Building 30 and Building 31 are of an architectural character that conveys a sense of permanency that is less characteristic of many of the other buildings on site. While all buildings are related to the orthogonal grid, and many are of masonry construction, they are of a more utilitarian design and thus appear transitory and incidental to the other structures.

In the southeastern sector of the site, opposite the east face of the Quad, are Buildings 8 and 9, two government built residences that originally fronted on 4th Street when it continued past Grove Street (where it now terminates) to Montana Avenue south of the property. The former street right-of-way has been used for onsite parking for many years. Interspersed among the occupied buildings are a variety of smaller structures housing mechanical, electrical and storage functions.

3.3.2 Places and Open Spaces

Although the arrangement of buildings and landscape on the RML campus lacks a formal orthogonal geometry, the open space extending from 4th and Grove Streets to the connection between Buildings 25 and 28, contain elements of the axial master planning philosophy that was prevalent in the early 20th Century. This portion of the campus is flanked on both north and south by a miscellany of buildings and structures that frame an irregular open service courtyard. Colored concrete walkways, bike racks and picnic tables with shelters and landscaping are planned in this area that has been dubbed the "Pedestrian Corridor." This work is under contract and will be completed in 2015. Spaces leading north or south from this axial service yard are loosely defined and mostly occupied by circulation and service functions with little architectural definition or character.

The only formal exterior courtyards on the campus are located Between Buildings 25 and 28 and within the Quad complex. As contained spaces, they are accessible only from the buildings that surround them.

There remains a large amount of unoccupied open space, especially on the north and west portions of the site, all of which are architecturally undefined. The western portion of the site that extends to the Bitterroot River offers most compelling views of the Bitterroot Mountains rising across the river from the site, providing a backdrop of singular beauty.

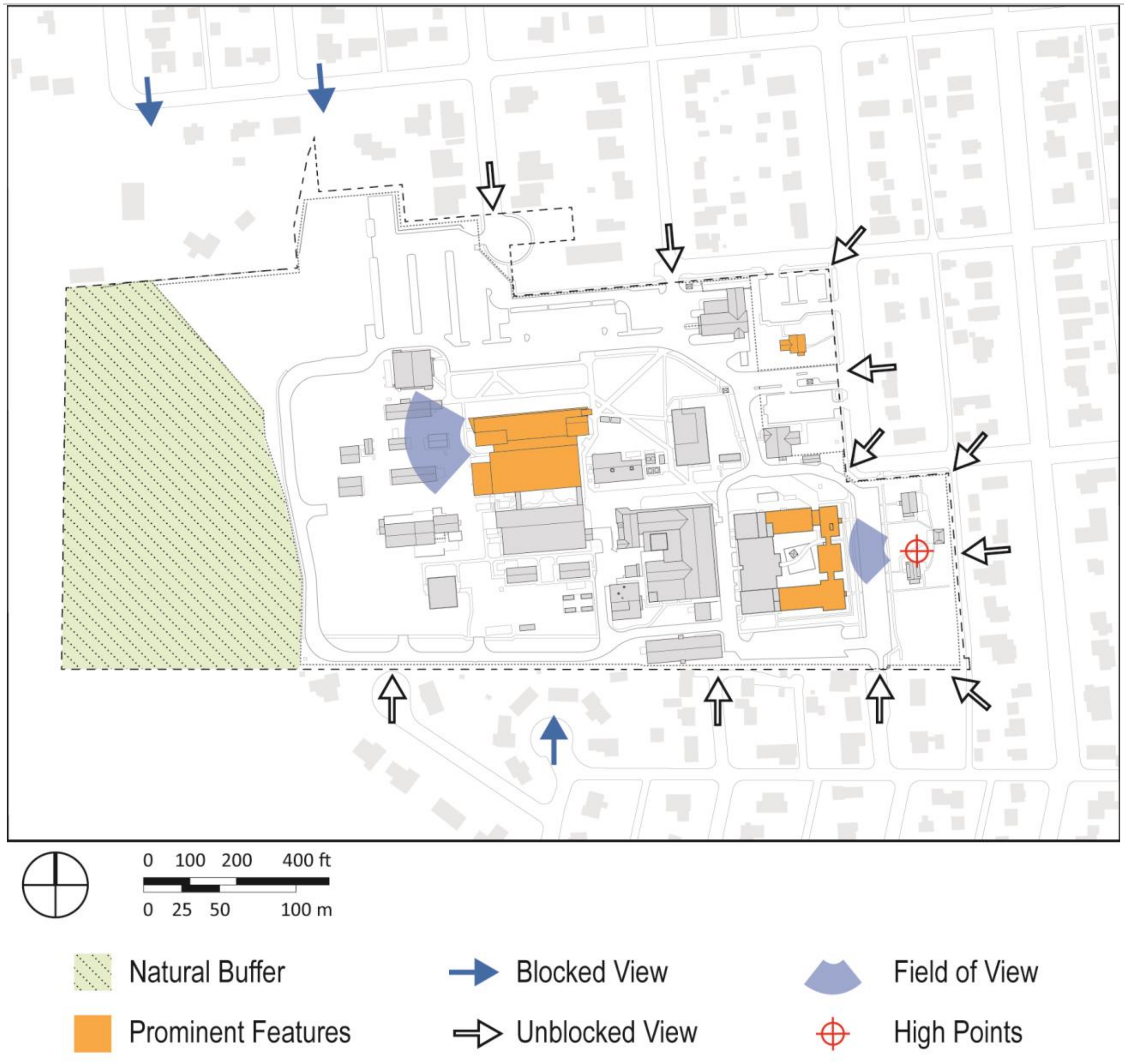

Exhibit 3-12: Existing Views and Prominent Features

3.3.3 Building Heights

Building 28 at a height of 52 feet, is the tallest building on the campus. A portion of the Quad is at 50 feet. All of the other buildings, except the residences (Buildings 8 and 9), are single-story and of a relatively low profile. (Refer to Exhibit 3-14). The placement of the tallest building at the center of the site provides a focus that is visually apparent from nearly every vantage point surrounding the campus, although the Quad continues to retain a sense of prominence when seen from 4th Street or Grove Street from which most traffic approaches the site.

Exhibit 3-13: Aerial view of the RML Campus from the East (1/9/2015)

Exhibit 3-14: Building Height

3.4 FEDERAL REAL PROPERTY COUNCILS PERFORMANCE MEASURES

On February 4, 2004, "Executive Order (EO) 13327 Federal Real Property Asset Management" was issued "to promote the efficient and economical use of federal real property resources in accordance with their value as national assets and in the best interests of the nation".

HHS utilizes the following mandatory performance measures in the management of real property assets:

- mission dependency
- facility condition index
- utilization rate
- operating cost
- disposal of unneeded assets

Current building performance metrics are summarized for each building on NIH RML Campus at the end of this section and discussed in detail herein.

Exhibit 3-15: Federal Real Property Performance Measures

Building Name	Predominant Use Type	Mission Dependency	Condition Index	Utilization Code	Functional Suitability	Notes
RML 01	Lab	Mission Critical	94	Over Utilized	Suitable	The Quad Laboratory
RML 02	Lab	Mission Critical	99	Utilized	Suitable	The Quad Laboratory
RML 03	Lab	Mission Critical	99	Utilized	Suitable	The Quad Laboratory
RML 05	Lab	Mission Critical	99	Utilized	Suitable	The Quad Laboratory
RML 06	Lab	Mission Critical	98	Utilized	Suitable	The Quad Laboratory
RML 07	Lab	Mission Critical	100	Utilized	Suitable	The Quad Laboratory
RML 08	Administrative	Not Mission Dependent	90	Under Utilized	Marginal	Vacant due to security concerns
RML 09	Administrative	Not Mission Dependent	99	Under Utilized	Marginal	Vacant due to security concerns

Building Name	Predominant Use Type	Mission Dependency	Condition Index	Utilization Code	Functional Suitability	Notes
RML A	Shared Lab support, central utilities	Mission Critical	99	Utilized	Suitable	The Quad Laboratory
RML 11	Administrative	Not Mission Dependent	100	Under Utilized	Marginal	Vacant due to security concerns
RML 12	Lab - Central	Not Mission Dependent	100	Utilized	Marginal	Freezer Storage, Fitness
RML 13	Lab - Animal	Mission Critical	97	Utilized	Suitable	Animal
RML 13B	Lab	Mission Critical	100	Over Utilized	Suitable	Laboratory
RML 15	Storage	Mission Critical	95	Utilized	Suitable	Radiological Storage
RML 22	Storage	Mission Dependent	100	Utilized	Suitable	Central Stock Room
RML 23	Light Industrial	Mission Critical	100	Utilized	Suitable	Incinerator with scrubber
RML 24	Light Industrial	Mission Critical	100	Utilized	Suitable	Emergency Generator
RML 25	Lab - Animal	Mission Critical	99	Utilized	Suitable	High Containment Lab
RML 26	Light Industrial	Mission Critical	100	Utilized	Suitable	Central Boiler Plant
RML 27	Light Industrial	Mission Critical	100	Utilized	Suitable	Emergency Generator
RML 28	Lab –Animal	Mission Critical	100	Utilized	Suitable	High Containment Lab
RML 29	Service	Mission Critical	100	Utilized	Suitable	Shipping and Receiving
RML 30	Other Institutional	Mission Critical	100	Utilized	Suitable	Visitor's Center
RML 31	Admin	Mission Critical	100	Over Utilized	Suitable	Lab, Admin and Computational Center
RML 32	Animal	Mission Critical	100	Utilized	Suitable	Vivarium

Building Name	Predominant Use Type	Mission Dependency	Condition Index	Utilization Code	Functional Suitability	Notes
RML HD1	Service	Mission Dependent	97	Utilized	Marginal	Maintenance shops
RML HD2	Service	Mission Dependent	91	Utilized	Marginal	Maintenance shops
RML HD3	Service	Mission Dependent	98	Utilized	Marginal	Maintenance shops
RML HD4	Service	Mission Dependent	92	Utilized	Marginal	Maintenance shops
RML HD5	Service	Mission Dependent	96	Utilized	Marginal	Maintenance shops
RML SS1	Storage	Mission Dependent	100	Utilized	Marginal	
RML SS2	Storage	Mission Dependent	100	Utilized	Marginal	
RML SS3	Storage	Mission Dependent	100	Utilized	Marginal	
RML SS4	Storage	Mission Dependent	100	Utilized	Marginal	
RML T23	Administrative	Mission Dependent	N/A	Over Utilized	Marginal	ORF offices
RML T25	Storage	Mission Dependent	N/A	Utilized	Marginal	
RML ARMCO-1	Storage	Mission Dependent	100	Utilized	Suitable	Vivarium Storage
RML ARMCO-2	Animal	Mission Critical	100	Utilized	Suitable	Quarantine and Surgery
CONEX 1	Storage	Mission Dependent	N/A	Utilized	Suitable	
805 South 4th St.	Residential	Not Mission Dependent	Not Evaluated	Under Utilized	Obsolete	Vacant

3.4.1 Mission Dependency:

NIH evaluates the functions within each of its real property assets, categorize the asset, and enter the category into the NIH asset inventory system using the following designations:

- <u>"Mission Critical"</u> - Without the constructed asset or parcel of land, the NIH mission is compromised.
- <u>"Mission Dependent"</u> - The asset does not fit into "Mission Critical" or "Not Mission Dependent" categories. The asset's primary function supports the Mission.
- <u>"Not Mission Dependent"</u> - The NIH mission is unaffected.

Each asset receives only one category designation. Where there are multiple functions for a facility, then the highest applicable mission dependency category is utilized. The evaluation is based on the facilities function under normal operations, not a catastrophic scenario.

Exhibit 3-23 shows that 88% of NIH facilities are “mission critical”. 9% of NIH facilities are “mission dependent” and 3% are “not mission dependent”.

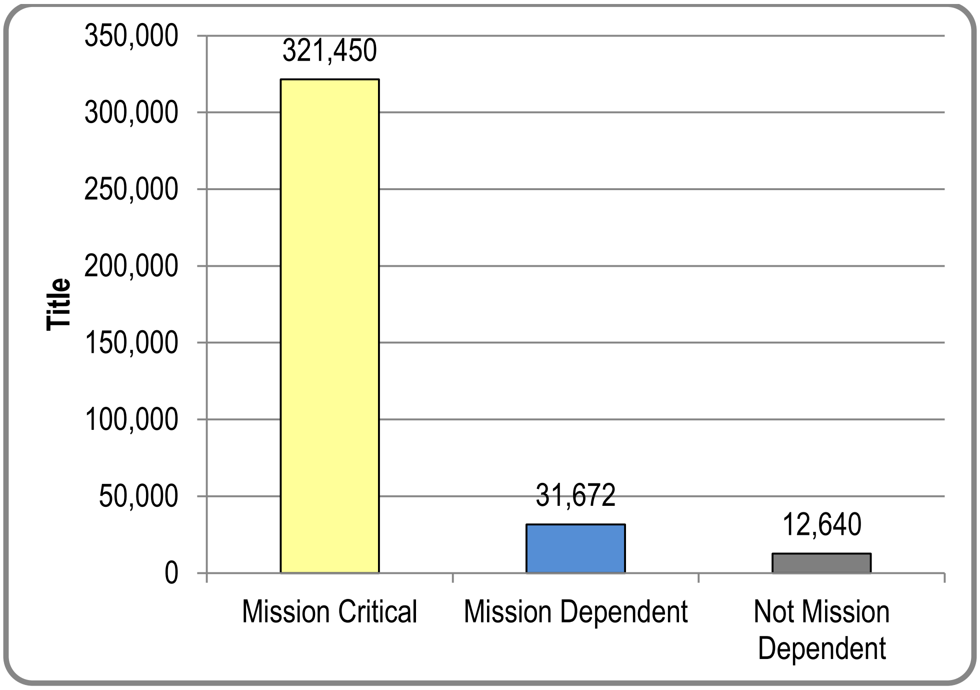

Exhibit 3-16: Mission Dependence

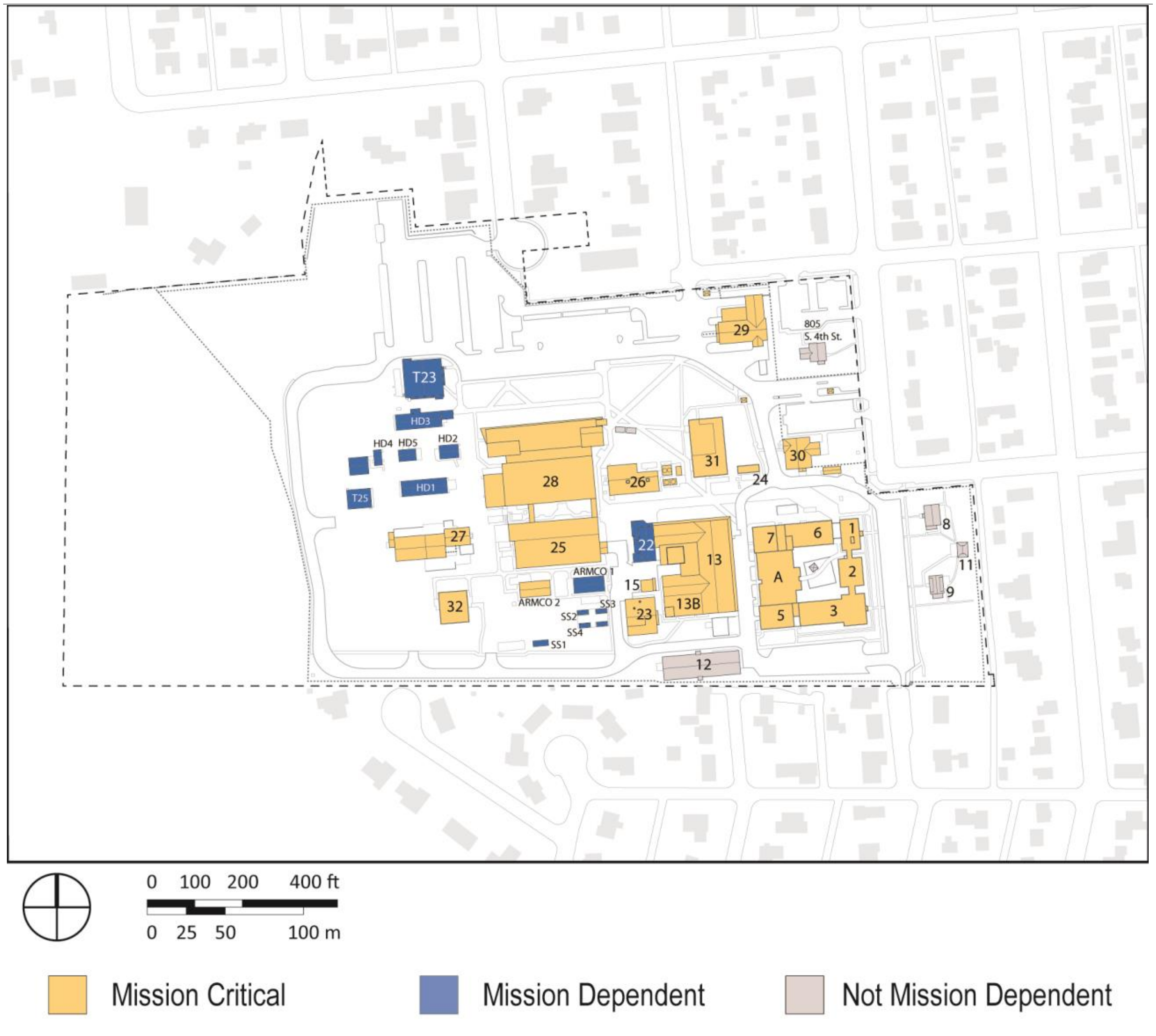

Exhibit 3-17: Mission Dependency

3.4.2 Building Conditions

Building conditions on the RML campus are rated using a performance metric established by the Department of Health and Human Services (DHHS). The Condition Index (CI)[1] links real property condition and stewardship to the Real Property Asset Management decision-making process. It sets performance goals relative to facility condition, assessment, prioritization of repair needs, and construction. It requires the consideration of these goals in budget decision making.

The CI is calculated using the following formula:

CI = (1 – ((repair needs) / (plant replacement value))) x 100

There are two components of funding:

- <u>Sustainment</u>: to maintain real property inventory from deteriorating
- <u>Improvement</u>: to address deferred maintenance backlog and improve conditions.

Sustainment consists of maintenance and repair activities necessary to keep the inventory of facilities in good working order. However, in order to improve the CI there must be a decrease in the backlog of maintenance and repairs (BMAR).

By 2017 NIH is required to have a CI =90 or above for all its buildings. Currently all of NIH RML campus buildings (excluding temporary buildings and Building 11 which is not occupied) meet or exceed CI = 90.

3.4.3 Facility Utilization

NIH bases its facility utilization measurement on an annual census taken every summer. The census counts each staff person who occupies NIH facilities. For the purpose of master planning, “Staff” includes Employees, Contractors and Fellows. No distinction is made between part-time and full-time employees, each of whom is counted as a whole number.

3.4.3.1 *Offices*

Administrative Offices are defined as buildings primarily used for office space. The utilization measure for offices is based upon the usable square footage (USF) currently being occupied

[1] United States Department of Health and Human Services, 2008 Update HHS Real Property Asset Management Plan, April 22, 2008.

relative to the total number of occupants in the space. The maximum space allowable for space planning and occupancy is 170 useable square feet (USF) per person, on average. The USF includes all office, office support space and a pro-rata share of any joint use space that is included in each tenant's assigned useable square feet. This standard applies to total space.

3.4.3.2 *Warehouses*

HHS warehouses generally operate as a centralized receiving, distribution, and storage operation. Their functions include, but are not limited to, the following: receiving, bar-coding, staging, distributing accountable property, providing short-term storage (not to exceed six months), and staging surplus property for disposal and/or reutilization; and packaging, palletizing, and staging shipments as necessary or for purposes of security screening and access controls. The utilization of warehouse space will be measured by the ratio of occupied area to gross square feet. The formula for warehouses will consist of the area (square feet) currently occupied for storage, as a percentage of the total gross area (square feet) of the warehouse. The formula is:

Actual Utilization (%) = ((Occupied Units) / (Design Capacity)) X 100.

- Occupied Units: the area (square feet) or number of units that are occupied.
- Design Capacity: can include any unit of measure based upon the material being stored or used. Examples include gross square feet, rental area, total number of units, total number or bins, etc.

3.4.3.3 *Laboratories*

The design capacity for HHS research laboratory for planning and occupancy purposes shall not exceed 460 net assignable square feet (nasf) per scientist. Research laboratory (e.g. “wet laboratory”) space includes: laboratory, laboratory support, and laboratory related offices.

The following laboratory functions are excluded and are measured separately from HHS standard laboratory utilization rate:

3.4.3.3.1 *Centralized Support*

Centralized laboratory stand-alone support facilities, such as centralized freezers, glass-wash facilities, and computer centers, are determined by use of appliances, equipment and instruments to support research on a centralized basis. Net assignable square feet per person will not be employed to determine the utilization rate for shared and centralized support laboratory spaces. Centralized support space exists to support research; therefore, they are utilized so long as there is research.

3.4.3.3.2 *Instrument or Special Purpose Laboratories, High Containment Laboratories and Clinical Research*

Special purpose and instrument laboratories are determined by size of equipment and instruments. Net assignable square feet per person will not be employed to determine the utilization of special purpose or instrument laboratories. Special purpose laboratories are utilized or not utilized. Likewise high containment laboratories (BLS-4) and clinical research space will be utilized or not utilized.

3.4.3.3.3 *Animal Research Facilities (Vivariums)*

The utilization of animal housing is based on the requirements in the "Guide for the Care and Use of Laboratory Animals (NIH publication 85-23)". The utilization of the related animal research facility support functions are determined by research protocols and species housed, including: necropsy, surgery, procedure room, cage-wash, quarantine area, sterilizer room, isolation, locker room, feed and bedding storage, X-ray, treatment room, behavioral testing room, microinjection room, transgenic lab suite, diagnostic lab suite, environmental experiment room, cage decontamination area, surge cage storage, field equipment room, material decontamination/entry, incinerator, tissue digester, food preparation kitchen, automatic watering system room, CVAC system support room shared space for records, locker rooms, animal irradiator, analgesic inhaler device, and waste disposal are determined by research protocols and species housed. Animal research facility support spaces are utilized or not utilized.

3.4.3.4 *Summary of Facility Utilization*

Current NIH RML Campus Facility Utilization ratings are indicated in Exhibit 3-20 and summarized in Exhibit 3-19. These exhibits show that 83% of NIH facilities are "utilized". Thirteen percent of NIH facilities are "over utilized" and 4% are "Not Utilized".

Exhibit 3-18. Facility Utilization Designators Table

Rating	Office	Warehouse	Laboratory
Over Utilized	< 128 usf	>85%	< 200 usf
Utilized	128-170 usf	50-85%	200 – 460 usf
Under Utilized	> 170 usf	10-50%	> 460 usf
Not Utilized		<10%	

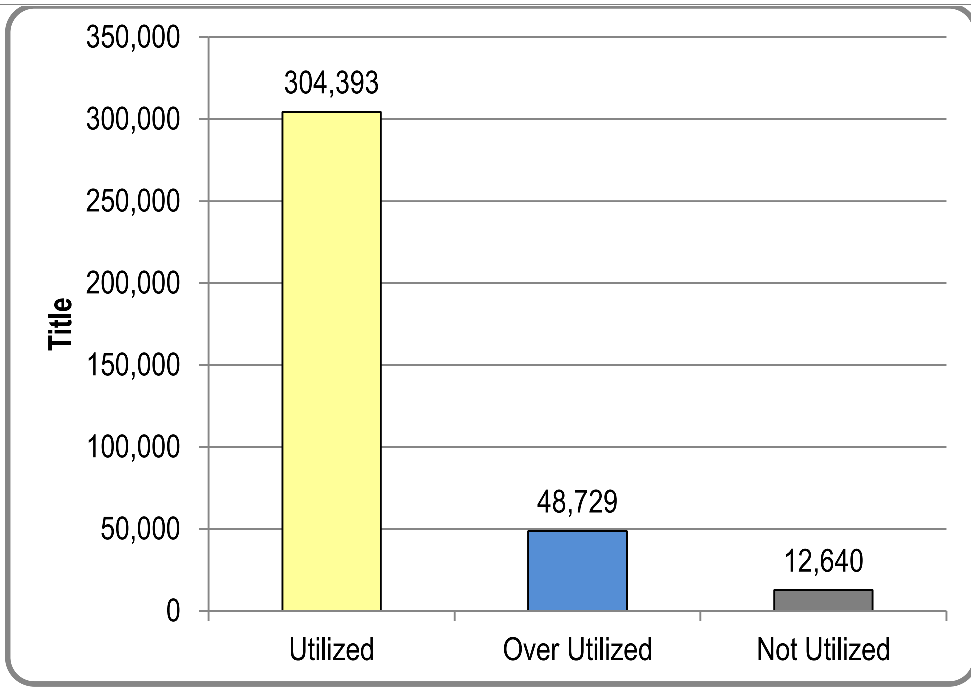

Exhibit 3-19: Facility Utilization Chart

Exhibit 3-20: Facility Utilization

3.4.4 Building Functional Suitability

Functional suitability is based on the ability of a particular structure to continue to be used effectively for the activity assigned to it. In some cases, buildings which are judged to be in fairly good structural condition may no longer meet the functional requirements of the uses they house, may be too close to the perimeter fence and therefore need structural hardening or may not have a high reuse potential for other activities. Buildings deemed to be obsolete could not practically be reused because of inadequate mechanical systems, inflexible structural systems, building configuration, or cost factors.

Most buildings on campus are considered to be functional for the uses they currently house. Marginal buildings include prefabricated buildings, industrial buildings and residential building that have been or need to be retrofitted for functions other than their original purpose. A summary of building functional suitability is graphically presented in Exhibit 3-21 and Exhibit 3-22. Eighty-nine percent of buildings on the RML campus are considered functionally suitable. Ten percent are considered marginal. The remaining 1% are obsolete. Several buildings on campus were built before the construction of the perimeter security fence and heightened security measures. The uses of these buildings are limited because of security concerns therefore they are categorized as functionally marginal.

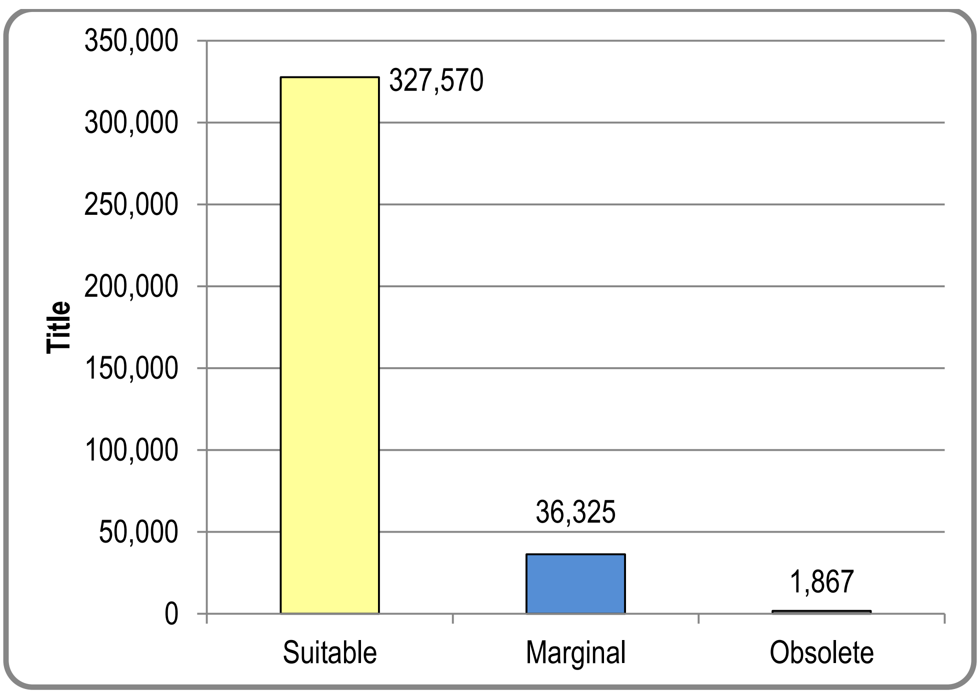

Exhibit 3-21: Building Functional Suitability Chart

Exhibit 3-22: Building Functional Suitability

3.4.5 Operating Cost

Building operating costs are depicted in Exhibit 3-23. NIH Office of Research Facilities and NIAID continue to work together to identify and implement opportunities for facility cost reductions by reducing the energy, water and material consumption on the campus.

3.4.6 Disposal Performance Measures

NIH evaluates existing buildings with life cycle cost analyses that compare major renovation to replacement costs. Where it is economically advantageous, obsolete assets are demolished and replaced with new state-of-the-art buildings capable of functioning at the highest level. Where the life cycle cost analysis reveals that renovation yields the best economic returns to the agency, the assets are renovated to provide further service.

- Disposal of Leases: NIH does not utilize leases in the RML area.
- Disposal of Owned Assets: HHS policy regarding retention of owned assets lays out conditions in which real property may be retained and directs NIH to dispose of properties that do not meet those conditions. HHS policy also clearly enumerates steps to be taken to dispose of excess properties or properties that otherwise do not meet the conditions for retention.

Exhibit 3-23: Current Building Performance Metrics Summary Table

Building Number	Predominant Use	Employees (2014 Census)	Gross Square Foot	Condition Index	Operating Cost [2]($/YR.)	Mission Dependency	Utilization
RML-01	Lab	14	8,246	94	180,273	Critical	Over Utilized
RML-02	Lab	12	9,468	99	206,988	Critical	Utilized
RML-03	Lab	41	24,814	99	542,481	Critical	Utilized
RML-05	Lab	14	7,224	99	157,930	Critical	Utilized
RML-06	Lab	36	15,000	98	327,928	Critical	Utilized
RML-07	Lab	15	3,975	100	58,089	Critical	Utilized
RML-08	Admin	0	4,461	90	58,806	Not Mission Dependent	Under Utilized
RML-09	Admin	0	3,156	99	41,603	Not Mission Dependent	Under Utilized
RML-A	Lab	5	24,929	99	328,617	Critical	Utilized
RML-11	Admin	0	660	100	6,293	Not Mission Dependent	Under Utilized
RML-12	Admin	1	7,690	100	112,379	Not Mission Dependent	Utilized
RML-13	Lab - Animal	23	17,800	97	389,142	Critical	Utilized
RML-13B	Lab	6	5,880	100	128,548	Critical	Over Utilized

[2] Operating Cost is derived from a standard ORF formula that allocates campus utility cost per building based on building function.

Building Number	Predominant Use	Employees (2014 Census)	Gross Square Foot	Condition Index	Operating Cost 2($/YR.)	Mission Dependency	Utilization
RML-15	Storage	0	1,092	95	10,413	Critical	Utilized
RML-22	Storage	5	2,624	100	38,346	Critical	Utilized
RML-23	Light Ind	0	2,356	100	34,430	Critical	Utilized
RML-24	Storage	0	700	100	10,230	Critical	Utilized
RML-25	Lab - Animal	1	33,901	99	741,129	Critical	Utilized
RML-26	Light Ind	7	5,664	100	82,771	Critical	Utilized
RML-27	Light Ind	0	1,961	100	28,657	Critical	Utilized
RML-28	Lab	90	111,590	100	2,439,568	Critical	Utilized
RML-29	Service	4	7,525	100	109,967	Critical	Utilized
RML-30	Other Instit	2	3,562	100	33,965	Critical	Utilized
RML-31	Admin	50	29,695	100	391,443	Critical	Over Utilized
RML-32	Animal	1	4,020	100	87,885	Critical	Utilized
RML-HD1	Service	0	3,072	97	35,688	Dependent	Utilized
RML-HD2	Service	0	1,120	91	16,367	Dependent	Utilized
RML-HD3	Service	1	3,482	98	76,150	Dependent	Utilized
RML-HD4	Service	0	512	92	11,197	Dependent	Utilized
RML-HD5	Service	0	864	96	18,895	Dependent	Utilized
RML-SS1	Storage	0	476	100	5,530	Dependent	Utilized

Building Number	Predominant Use	Employees (2014 Census)	Gross Square Foot	Condition Index	Operating Cost 2($/YR.)	Mission Dependency	Utilization
RML-SS2	Storage	0	4,908	100	17,220	Dependent	Utilized
RML-SS3	Storage	0	2,048	100	44,789	Dependent	Utilized
RML-SS4	Storage	0	2,048	100	44,789	Dependent	Utilized
RML-T23	Admin	24	8,246	N/A	180,273	Dependent	Over Utilized
RML-T25	Storage	0	2,000	N/A	17,220.00	Dependent	Utilized
RML-ARM1	Storage	0	2,048	100	44,788.79	Dependent	Utilized
RML-ARM2	Lab	0	2,048	100	44,788.79	Critical	Utilized
CONEX 1	Maint.	0	1,448	N/A	0	Dependent	Utilized
805 South 4th St.	Vacant	0	1,867	Not Evaluated	0	Not Mission Dependent	Under Utilized

3.5 AMENITIES

The proximity of commercial services in Hamilton has obviated the need for on-site amenities for the most part.

- Dining – Many employees bring their own lunches to work; others drive to their nearby homes; while still others frequent restaurants on U.S. Route 93. No on-site dining is offered other than scattered vending machines.
- Child Care – No on-site child care is offered, leaving employees to make their own arrangements within the community.
- Recreation and Fitness – Commercial fitness facilities are available in Hamilton, and there are many recreational opportunities throughout the Bitterroot Valley, including hunting, fishing, hiking, skiing and other sports. There are some formal fitness facilities on site.

In preparing the 2009 Master Plan, the RML staff was asked to respond to a questionnaire using a scale from 1 (Essential) to 5 (Unnecessary) to determine preferences for amenities such as conference rooms, food service, staff lounges, fitness centers, staff showers, bicycle racks and break rooms. Fifty-five staff members participated in the survey. The results of the survey indicate clear preferences for bicycle racks, break rooms, showers and lockers, food concessions and conference rooms accommodating 5 to15 people. Full service dining and conference rooms for 3 to 5 were seen as less important. The types and scale of amenities appropriate for NIH facilities is based on staff population, and the ranges are set forth in NIH's *Guidelines for Amenities and Services within NIH Facilities, December 2004*. Based on *the Guidelines*, the RML campus qualifies for several amenities including vending areas, wellness centers, unsupervised fitness rooms, bicycle racks, lockers/showers and lactation cubicles. Currently, only vending machines, bicycle racks and lockers/showers are provided. See Exhibit 3-24.

Exhibit 3-24: Amenities

3.6 ARCHITECTURAL CHARACTER

The architectural character of the buildings on the RML campus varies from the traditional brick Collegiate Gothic style of the Quad, to the Colonial Revival residences within the eastern portion of the historic district, to the various modern styles represented by the IRF, Visitors' Center, the Shipping and Receiving Building, and the assorted utilitarian buildings. In general, the site lacks a consistent architectural character that would prescribe future building designs (Exhibit 3-25).

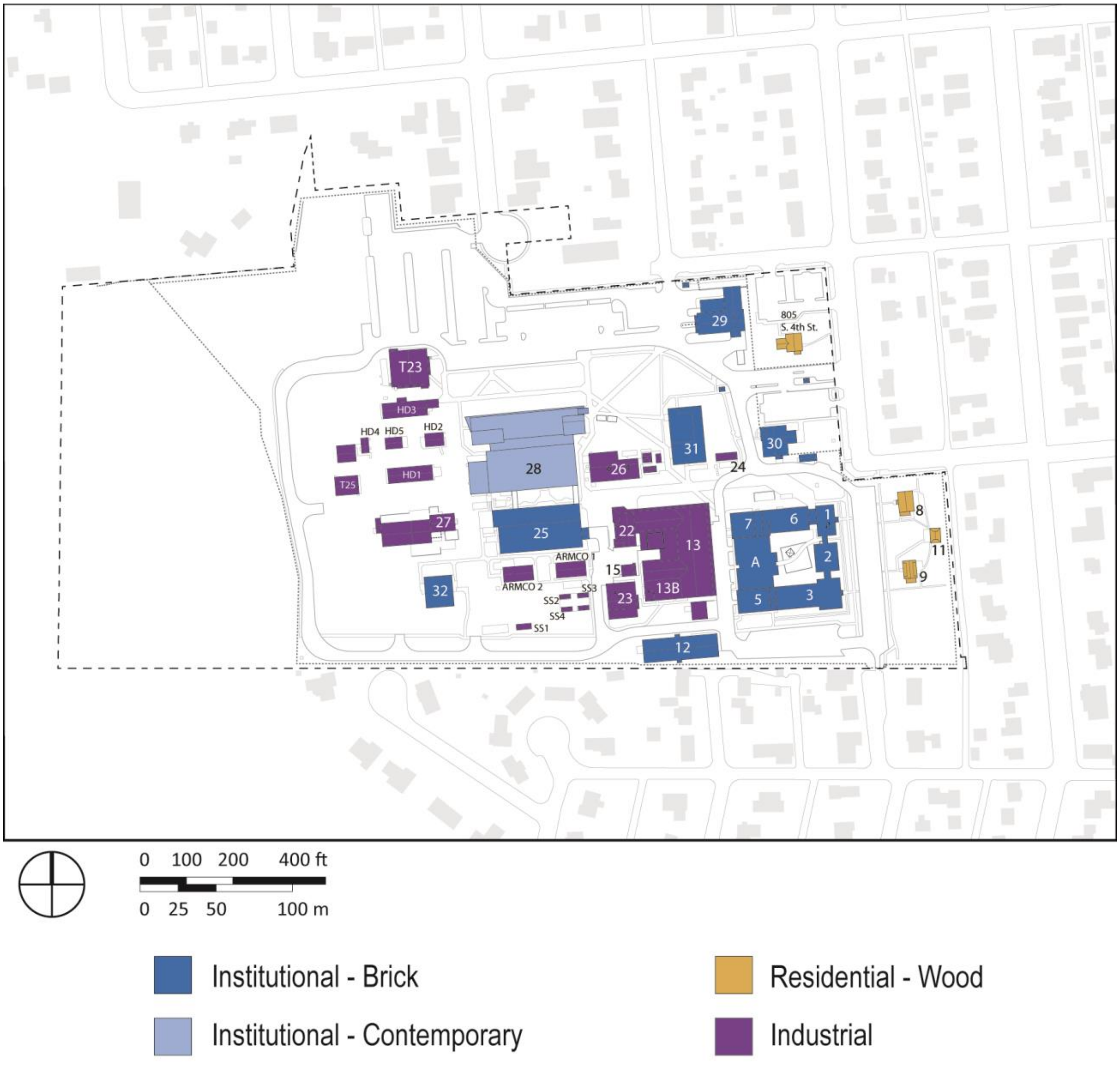

Exhibit 3-25: Architectural Character

3.7 HISTORICAL AND ARCHEOLOGICAL FEATURES

The eastern portion of the campus contains structures that together comprise the Rocky Mountain Laboratories Historic District which was listed in the National Register of Historic Places in 1988. The boundary description of the district in the Register includes Lots 1-9 of Block 18 and Lots 1-7 of Block 19 of the Pine Grove Addition to the City of Hamilton, MT. This includes RML Buildings 1, 2, 3, 4, A, 5, 6, 7, 8, 9 and 11, as well as site amenities such as mature trees, period lighting, and landscaping that contribute to the overall integrity of the District. See Exhibit 3-26.

The newly acquired 1 ½ story building at 805 South 4th St. was built in the 1930s and is a good example of late Craftsman styling and is also an early example of milled log construction, which has since become a major industry in the Bitterroot Valley. The house is associated with the development of new housing units built during the 1930's in the southwestern quarter of Hamilton in direct response to the need to accommodate the workers at the Rocky Mountain Laboratory. It is listed as the Conway House on the National Register of Historic Places and is presently vacant.

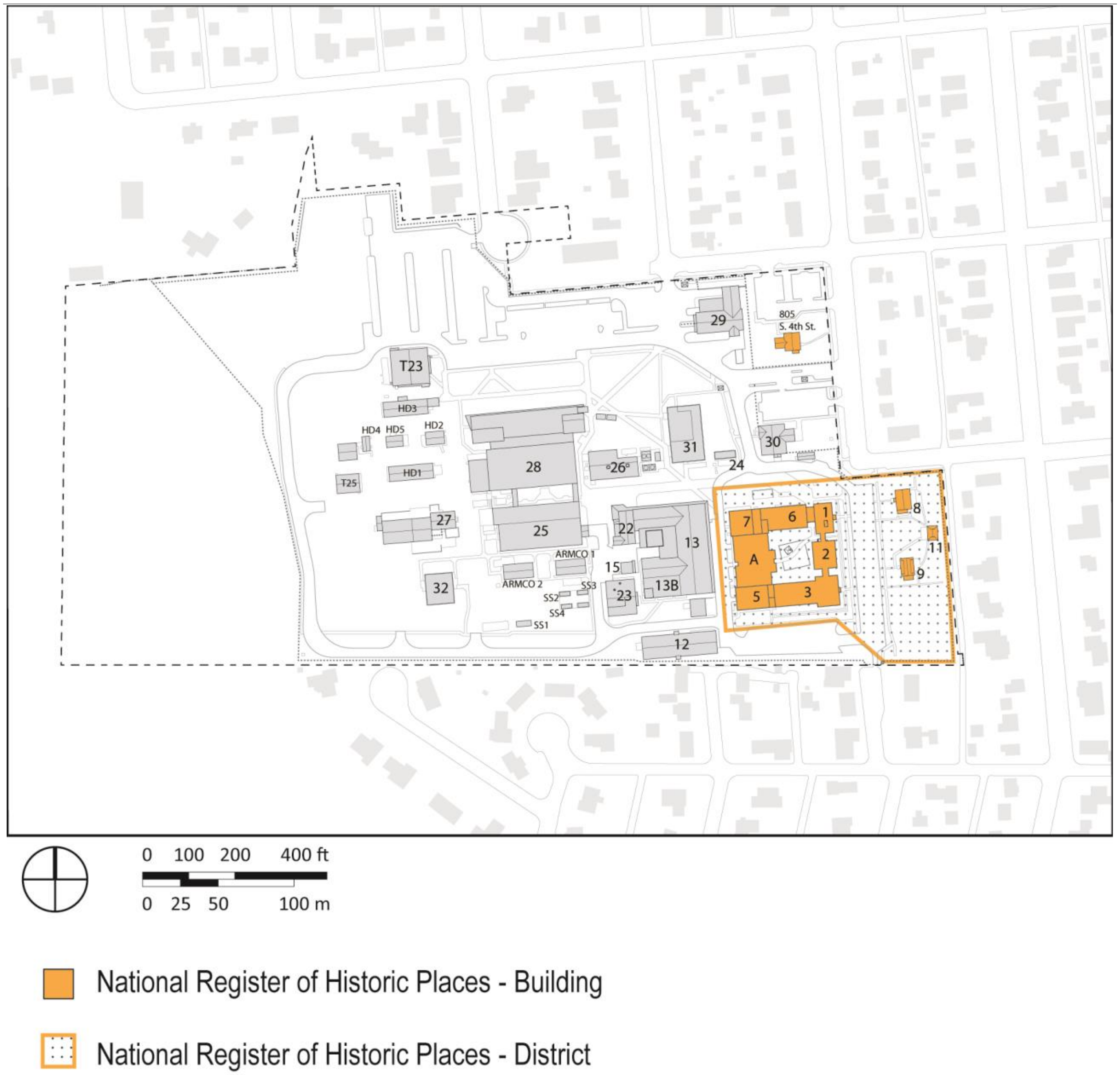

Exhibit 3-26: NIH Historic Properties and Archaeologically Sensitive Sites

3.8 ENVIRONMENTAL FEATURES

3.8.1 Climate and Outdoor Design Conditions:

The severity and variability of the climate in Hamilton warrants special design considerations for building envelopes and mechanical systems. These include special treatment of outside air and design and control strategies as they pertain to extreme outdoor conditions. The design parameters for outdoor conditions are as follows:

Exhibit 3-27: Climate and Outdoor Design Conditions Table

Location:	Hamilton, MT
Latitude:	46 degrees, 30 minutes
Elevation:	3,578 feet asl

Summer*	96° F dB / 65° F wB, Daily Range = 36° F
Winter*	-30° F
Heating - Degree - Days	7,931 (65° F base)

* Note- These are normal summer/winter extremes and are based upon NOAA weather records. These exceed the ASHRAE design parameters of -9 degrees F (99.6%) winter and 91/62 degrees F (0.4%) summer.

Hamilton's prevailing weather conditions are actually quite mild by Montana standards. However, the area experiences virtually the same extremes as the rest of the state. Very warm temperatures can be expected for a period of at least several days in the summer and can be accompanied by relatively high humidity levels. Extreme cold can also be expected for some duration every winter.

Use of the ASHRAE data tables for design temperatures should be considered very carefully as this data does not embrace, to any significant extent, the normal extremes. It is recommended that all buildings that utilize large amounts of outside air be designed to accommodate extreme temperatures, especially for winter conditions. As the data listed above indicates, the normal extreme temperatures for Hamilton are more than 20° F less than the recommended ASHRAE winter design temperature. No building system designed for -9° F will accommodate -30° F temperatures with ease, and if the fresh air (ventilation) load is at all significant, a massive under sizing of the mechanical systems may result by following ASHRAE criteria.

Humidity levels in the region are typically quite low and rise to significant levels only on a sporadic basis. Consequently, humidification systems must be installed to maintain even minimal indoor relative humidity levels. Without humidification systems, the winter indoor conditions would be less than 15% relative humidity for the bulk of the winter, and would rise only slightly above this in the summer. The fact that high outdoor humidity in the summer is expected to be significant at times, but is commonly quite low, implies that dehumidification systems are not normally required. Finally, the prevailing low outdoor humidity levels make the Hamilton climate very well suited to the use of economizer cooling with outdoor air for a great amount of time each year. They further allow the use of evaporative cooling as an energy saving measure for utilitarian type buildings which require cooling only in the summer months.

Caution must be exercised in building envelope design to ensure that vapor barriers are employed in a very complete fashion. The extremely low outdoor humidity levels in winter, combined with elevated levels indoors for a humidified building, give rise to a significant vapor pressure gradient. This gradient will drive considerable amounts of moisture through any breaks in a vapor barrier and will condense and freeze within building structures where this is allowed to happen.

The above analysis is taken from the 2002 Site Utilization Study by Architects Design Group of Kalispell, Montana. Complete meteorological data is available for Hamilton from the National Oceanic and Atmospheric Administration (NOAA) for the designers use.

3.9 EXISTING UTILITIES

3.9.1 Natural Gas

3.9.1.1 *Natural Gas Distribution System*

As the gas distribution shown in Exhibit 3-28 indicates, there are currently three small ¾” gas service lines and one large 6” industrial service line feeding the campus. The three small lines serve Buildings 8, 9, and 11 which are located on the east side of the former 4th Street right-of-way. These services extend individually to each building from the utility company’s service main in the alley between 3rd and 4th Streets south of Grove Street. Each building serviced is fitted with its own meter and service regulator as is typical for residential gas service.

The 6” industrial service line, which enters the north side of campus, was installed in 2000 and is constructed of polyethylene. This high capacity line originally served only the new steam plant in Building 26, but it later became the source for an entirely new campus distribution system installed in 2003. With the exception of Buildings 8, 9 and 11; this line services all of the facilities on campus.

The new campus gas distribution system is constructed entirely of polyethylene. It is routed as indicated on the distribution plan and has a depth of bury which generally ranges from 18” to 24”. The previous gas distribution system was abandoned in place and is largely constructed of steel. When abandoned, the system was cleared with compressed air in compliance with Fuel Gas Code requirements.

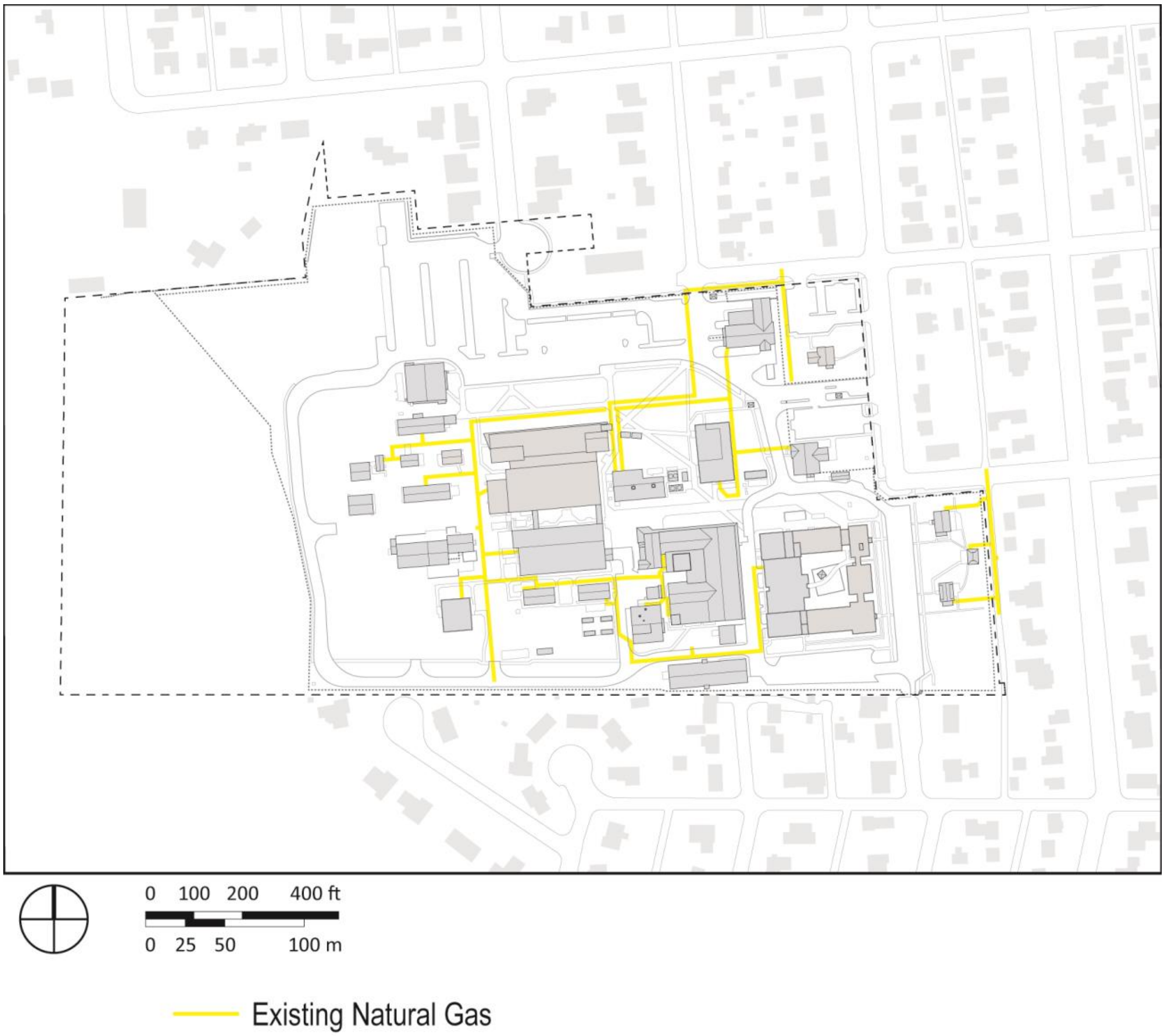

Exhibit 3-28: Existing Natural Gas Distribution

3.9.1.2 *Natural Gas Capacity*

The maximum amount of natural gas available to the campus depends upon both the on-campus distribution line size and on the limitations of the utility company distribution system that serves the campus.

The current load on the 6” service line is on the order of 130,000 standard cubic feet per hour (scfh). The on-campus portion of this line will accommodate an additional 60,000 scfh of loading with a moderate pressure drop. This would accommodate the addition of a fourth boiler in the boiler plant plus all other current campus usages. However, according to Northwestern Energy, the local utility, this will overtax their existing distribution piping in the area and they would be forced to replace their existing 4” branch line that serves this part of town with a larger main or install a dedicated service to serve RML. A study of the local utility providers’ capabilities to support campus growth would be necessary with any new building addition and very important to confirm early in any design process.

The gas distribution pressure on campus is unregulated. That is to say it is distributed at 30 psi – the same pressure at which the utility company distributes gas in their mains and branches. This allows tremendous capacity in the distribution system, even in piping of fairly minimal diameter. The gas is metered at the northwest corner of Building 26 and then distributed without reduction in pressure. A regulator is used at each building service riser in order to reduce incoming gas to the appropriate pressure. For all but the incinerator building and the boiler plant, the building service pressure is reduced to 7” water column (1/4 psi) before the gas line enters the building.

3.9.1.3 *Natural Gas Deficiencies:*

There are no known deficiencies in the distribution system but the system is limited by the ability of the Utility Company to provide gas for the full build out of the steam plant, if full build out becomes necessary, as discussed above.

3.9.1.4 *Natural Gas Future Projected Loads:*

The largest future load that is anticipated is the addition of a fourth boiler to the boiler plant for N plus 1 redundancy. The use of three boilers would mean that the potential load on the gas service could be as much as 180,000 scfh. Please refer to the Steam Sections 3.9.2 for potential growth of the Steam Plant.

The campus loads downstream of the boiler plant are dominated by the incinerator in Building 23. That building has a connected load of just below 10,000 scfh. Building C, the new maintenance and facilities complex would be situated at the southwest corner of the campus, some 1,100 feet from the campus gas meter at the boiler plant. Even using an extremely liberal heat loss value of 75 Btu per hour per square foot for the entire Building C complex, the total pressure drop in the distribution piping between the campus meter and Building C would barely exceed 10 psi – one half to one third of the available pressure. As such, the campus pipe sizing would be easily adequate to execute the potential construction now outlined in the Master Plan Update.

3.9.1.5 *Natural Gas Recommendations:*

There is no immediate known need to increase the capacity of the natural gas service to the campus at this time. Individual building gas services can be provided as needed from the existing infrastructure in place.

If the need arises to satisfy the potential future demand of 180,000 scfh, NorthWestern Energy reports that they would need to replace approximately 2,200 feet of upstream 4" main line with 6" or large piping. The utility company estimates that this would cost approximately $130,000 (November 2008 estimate). The lead time the utility would need to engineer and execute the replacement would be on the order of three to four months.

For an illustration of the projected natural gas distribution for the Master Plan Update, refer to Chapter 4.

3.9.2 Steam System

3.9.2.1 *Steam Plant*

The steam plant in Building 26 was constructed in the year 2000 and replaced Building 7 as the central steam plant on campus. The original construction project for Building 26 included two dual-fuel water tube boilers, a condensate receiver tank with redundant transfer pumps and a spray type deaerator unit with redundant feedwater pumps for each boiler. Each of the two boilers is rated to produce 50,000 Lbs/Hr of 100 psi steam burning either natural gas or No. 2 fuel oil. The original plant design intended for one of the two boilers to be active with the second functioning as a full standby. In order to support the increase in load posed by the construction of Building 28 in 2003, the plant was expanded to the east. The expansion project included the installation of a third dual fuel 50,000 Lbs/hr boiler, a companion boiler feed pump and a stack suitable in size to accommodate two additional boilers; although only one boiler has been installed per the expansion project. Similar to the original arrangement where one boiler was held as a full standby, the current plant design intends that two of the three boilers will accommodate the entire connected campus load with the third boiler serving as a full standby unit for redundancy or N+1. The plant expansion design also allows for the addition of a fourth boiler. A fourth boiler is under contract to be installed in 2015. This boiler is primarily to accommodate low steam demand periods which are more the norm than the exception. The existing 50,000 Lbs/hr boilers cannot turn down sufficiently during low demand periods and this causes operational difficulties and inefficiencies. The condensate and boiler feed assemblies are sized adequately to accommodate the current arrangement of two active boilers with a third as a standby unit. The addition of this fourth boiler does not require modifications to these components as it is not intended to augment the overall capacity and would not be used in the firm capacity calculations.

The boilers burn natural gas as their primary fuel and utilize No. 2 fuel oil as a back-up fuel source. A 20,000 gallon fuel oil storage tank sits along the north side of the building and stores enough fuel for approximately 4 days of plant operation for the peak month based on FY2004.

Steam is produced in the boiler plant and distributed to the connected buildings at approximately 100 psig. For buildings that are connected to the plant, steam is generally utilized to provide building heating, for production of domestic hot water, and for sterilization and cage and glassware washing processes where applicable. It is also used for building humidification whether directly or through indirect generation of clean steam from a treated water source.

A project was completed in 2012 that improved the instrumentation and controls of the boilers, combustion air system, and other components to improve efficiency and data collection.

The steam plant is served by the overall campus generator back-up system although it has its own dedicated emergency power generator that is situated in the plant itself. The fuel supply for the generator is No. 2 fuel oil. This generator would provide an additional layer of redundancy. It has a base tank beneath the engine set and is plumbed to the large storage tank outside.

The steam plant operates continuously year-round with no outages tolerated without significant impact to the facility.

The majority of the scientific buildings on campus are connected to the central steam system. However, there are a number of smaller buildings that are not. The facilities not connected to the central steam plant include Building 30 (Visitor's Center), Building 29 (Receiving), Building 27 (West Emergency Generator), the five HD buildings, the two ARMCO buildings, Buildings 8, 9 and 11 and Building 15. Buildings 13 and 22 are not directly connected to the plant but derive their heat through the systems in Building 13B.

3.9.2.2 *Steam Distribution System:*

Steam is distributed from Building 26 to the connected buildings in a radial arrangement. Service lines extend outward from the plant to the buildings they serve. The system piping is not looped in any way and there are no buildings that can be "back-fed" using alternate steam supply routing in the event of a pipe break. With the exception of two short shallow trench runs and the distribution through Building 7, 25 and 28; all below-grade steam and condensate piping is of the direct bury type.

There are three main steam supply branches to the distribution system. The newest and smallest is a 6" line which leaves the west side of the plant and immediately enters a manhole. Currently, the only line leaving the manhole is a 4" supply to Building 31. The other two branch lines are much larger. They originate from a single 12" line leaving the plant at the southwest corner.

Immediately after leaving the plant, the 12” line splits into two separate 12” branches inside an exterior vault. One of the 12” lines is routed to Building 7, and then on to Building “A” where it serves the rest of the Quad complex. It then exits the Quad complex and continues on to serve Buildings 12 and 13B. Buildings 13 and 22 are fed from the Building 13B service. The other 12” branch is routed to Building 28. After branching to serve Building 28, this line continues on to serve Buildings 25 and 32.

The campus steam plant is located in Building 26 and was constructed in the year 2000. The “old” steam plant previously located in Building 7 at the northwest corner of the Quad complex has been renovated and converted into laboratory space. The two buildings continue to be connected by a large 12” underground steam main along with two 4” pumped condensate lines which, as mentioned earlier, continue on to provide steam to the rest of the Quad complex and Buildings 12, 13, 13B and 22.

The 12” steam line serving the IRF (Building 28) is routed from a manhole at the southwest corner of the steam plant to the east wall of Building 28. The piping is conventional steel and is housed in a precast shall trench system. At Building 28 the piping penetrates the foundation wall directly into a foundation level utility tunnel. It then extends through the sub-floor tunnel to the chiller plant at the southwest corner of the building. The 12” steam main rises in the Building 28 chiller plant and extends overhead to the west wall. There it is capped for future extension. Along the way, this line provides an 8” riser into the Building 28 mechanical room. In the chiller plant (located in Building 28), a branch line serves the steam-fired absorption chiller and another 6” steam line extends out of the chiller building and routes underground into the Building 25 mechanical room.

The underground piping between Building 26 and Building 7 was installed between the years 2000 and 2001. The underground piping between Building 26 and Building 28 and between Buildings 28 and 25 were installed between 2005 and 2006. Both the steam and the condensate systems in each of these cases utilize a direct-bury conduit system. The conduit system is Ricwil “Multi-Therm 500” and is comprised of schedule 40 steel carrier piping with calcium silicate or rock wool insulation, a spiral welded steel outer casing, which is insulated on the exterior with foam insulation and an FRP (fiberglass reinforced plastic) outer jacket. The underground piping mains which leave Building A to serve Buildings 12, 13, and 13B are also this same type of piping (Ricwil Multi-Therm 500) but were installed between the years of 1995 and 2000.

New steam and condensate lines were installed in 2008 to serve Building 31. The lines originate in the manhole at the west side of Building 26. Separate steam and condensate lines are utilized. The steam is 4” size and the condensate is 2” size. These are direct buried piping systems similar to the Ricwil Multi-Therm 500 but differ slightly in construction. The pipe system is Thermacor Process model “Duo Therm 505”. Each line consists of seamless ASTM A106 steel service pipe with mineral wool insulation suspended inside a 10 gauge steel carrier conduit that is exterior insulated with closed cell polyurethane foam and covered with a high density polyethylene (HDPE) jacket. The steam service piping is schedule 40 and the condensate service piping is schedule 80.

In 2008, a 2 ½" steam and a 1 1/2" condensate branch service line was installed off of the Building 25 steam line to serve Building 32. The underground piping product is the same as used for the Building 31 service lines. The lines originate in the interstitial space of Building 25 and extend outdoor at the south side of the southwest corner of Building 25 and then extend underground to the north side of Building 32.

For an illustration of the exiting steam distribution plan, refer to Exhibit 3-29.

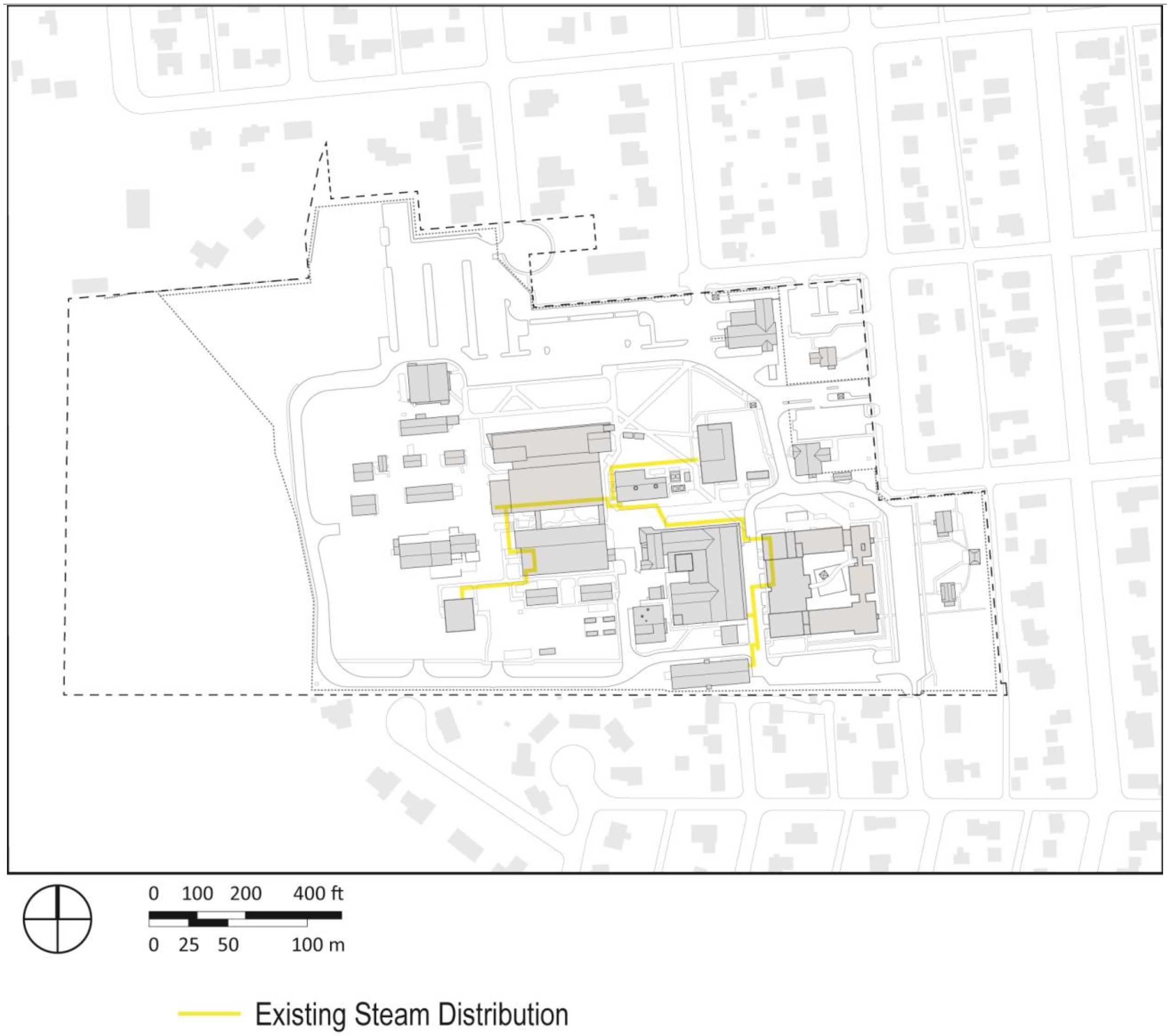

Exhibit 3-29: Existing Steam Distribution

3.9.2.3 *Steam Capacity*

3.9.2.3.1 *Steam Plant*

The steam plant (Building 26) currently houses three boilers, each rated to produce 50,000 lbs/Hr of 100 psi steam. The plant design intends that two boilers be sized to accommodate the entire connected campus load with the third boiler serving as a full stand-by unit for redundancy.

The actual available capacity from the plant is the rated output of two boilers less the amount of steam consumed within the plant itself for the deaerator unit which pre-heats the feed water before admitting it to the boilers to make steam. The amount of heat required by the deaerator depends primarily on the makeup water load (the amount of fresh cold water admitted to the system). In turn, the makeup water consumption rate is driven primarily by the humidification loads on campus. It is estimated that the deaerator could consume as much as 3,500 Lbs/Hr of steam, leaving the available steam capacity from two boilers to be 96,500 Lbs/Hr.

During cold weather experienced in January of 2004, prior to the construction of Building 28, with outdoor temperatures of -25°F, the maximum steam demand recorded for the entire campus was 24,300 lbs/hr. The estimated load posed by Building 28 is between 30,000 and 35,000 lbs/hr. The combined load posed by Buildings 31 and 32 is approximately 5,000 lbs/hr. As such, the current peak campus design load should be considered to be in the range of 60,000 to 70,000 lbs per hour of steam. Actual loads observed since Buildings 28, 31 and 32 have been on line, although not fully loaded, have not exceeded 50,000 pounds per hour as of year 2014. The observed steam demand in November 2014 was 29,000 lbs/hr at outside air temperatures of 5 below zero Fahrenheit. Calculations, combined with empirical data to date, indicate there should be at least 26,500 lbs/hr to 36,500 lbs/hr of capacity available to accommodate future loads.

3.9.2.3.2 *Steam Distribution System:*

The single pipe carrying the greatest amount of steam on the RML campus is the common 12" distribution line that splits outside the plant to feed the two 12" branch mains that extend to Building A and Building 28. This short section of pipe is connected to the steam header inside the boiler plant, extends to the exterior wall, drops into the piping pit at the interior southwest corner of the steam plant and then exits into the exterior valve vault where it splits into two 12" mains. Based on velocity, this pipe has a nominal maximum capacity of approximately 180,000 lbs/hr. The current connected load on this section of pipe is less than 64,000 lbs/hr. Note that this is the theoretical load that would be achieved if all the equipment on campus operated simultaneously at full capacity. Due to diversity, it is expected that the load on this line would not exceed the current estimated plant load of 60,000 to 70,000 lbs/hr. As one can surmise, the current load could more than double without undue loading on this section of pipe. Also, the 20,000 to 25,000 lbs/hr of peak load that is estimated to be associated with the current master plan would not overly tax this pipe either. What is notable about this pipe is that, with the exception of the small amount of steam consumed by Building 31, it carries all of the steam to the campus and has no parallel counterpart.

3.9.2.3.3 *Building 28 Steam Distribution Piping:*

The 12" service line to Building 28 leaving the manhole at the southwest corner of the plant is less than 100 feet in length before it branches to serve the Building 28 mechanical room. At 15,000 feet per minute maximum velocity, the capacity of this pipe for 100 psig steam would be approximately 180,000 lbs/hr. Velocity is the limiting factor for this size pipe at this pressure, since the amount of steam flowing at a pressure drop of 5 psi per 100 feet would easily exceed 15,000 feet per minute, as would the amount of steam for a total pressure drop of 25 psi for this relatively short length of pipe. Allowing a load range of 30,000 lbs/hr and 35,000 lbs/hr for Building 28, a connected load of approximately 16,000 lbs/hr for Building 25 and a load of 1,500 lbs/hr for Building 32, the total connected load on this 12” line will be between 47,500 and 52,500 lbs/hr. Although the absorption chiller has a maximum load of approximately 15,000 lbs/hr, it is neglected here since presumably a maximum heating and maximum cooling load will not be encountered simultaneously. This leaves a presumed spare capacity in this piping branch of between 127,000 and 132,000 lbs/hr. It can be concluded that at current loads the piping is operating at 25% of its capacity and the load on this branch could be tripled, if desired, to serve future loads.

The 6” line branching from Building 28 to serve Building 25, at 15,000 feet per minute velocity and carrying 100 psig steam, has a capacity of approximately 46,000 lbs/hr. For a pressure drop rate of 5 psi per hundred feet, the capacity would be very nearly the same. For a total pressure drop of 25 psi, the capacity would be many times greater than listed above and would be limited by either velocity or the nominal pressure drop rate per 100 feet of pipe. The total connected load at Building 25 is approximately 16,000 lbs/hr. The branch line serving Building 32 has a load of 1,500 lbs/hr. This leaves a presumed spare capacity of more than 27,000 lbs/hr in the 6” Building 25 service line. This number would become nominally higher if a diversity factor were allowed for either equipment or if another building were added to the line. It can be presumed from the above discussion that Building 25 could approximately triple in size or that two other similar buildings could be served by the same 6” line. It is worth noting that the assumed loads for Building B and Building G are 7,000 lbs/hr and 14,000 lbs/hr, respectively and that the combined load for these could potentially be added to this line. However, logistics and a desire for indoor isolation valves may make it more feasible for lines serving these future facilities to originate inside the Building 28 chiller plant.

3.9.2.3.4 *Building 7 Steam Distribution Piping:*

The 12” steam line leaving Building 26 and servicing Building 7 can potentially handle 180,000 lbs/hr or more. However, for this line, special consideration must be made for the grading as it travels a significant distance and slopes very little. During design of the heat plant, this line was sized specifically to handle flow rates up to at least 100,000 lbs/hr (or at least three times its current connected load) in order to keep velocities below 10,000 feet per minute. This allows the condensate in the pipe to move with the steam and to be removed at its trapping stations. The conclusions that can be drawn regarding this line are:

1) It can tolerate up to three times its current load for its entire length without problems, and

2) It can be branched along its length to serve other facilities and could potentially serve an additional load of up to 130,000 lbs/hr in this manner. Modifications to this line or significant increases above its current flow rate should be made carefully and with sound engineering judgment.

The last steam piping run to discuss in detail is the line serving, then leaving, Building A. Once inside Building 7, the 12” steam line from Building 26 reduces in size to an 8” line. The nominal capacity of an 8” line for 100 psig steam is 80,000 lbs/hr, based both on velocity and pressure drop rate. Like the 12” pipe discussed above, this figure should be carefully tempered according to condensate management practices. The 8” steam line serving Building A, and the connected quad structure serves a winter-time load of approximately 45,000 lbs/hr. A branch from this line, 6” in size, extends through the mechanical room of Building A and then leaves this building in a direct-bury conduit system and routes underground to serve Buildings 13/13B/22 (via Building 13B), and Building 12. The connected loads are calculated as: 13,000 lbs/hr for Building 13 and 650 lbs/hr for Building 12 for a total of approximately 13,650 lbs/hr. The capacity of the 6” branch leaving Building A is 50,000 lbs/hr based upon velocity and pressure drop rate. This indicates that there is an abundance of spare capacity in this line. However, again, care must be taken when applying this information. The best conclusions that can be drawn without knowing specifics of where any additional loads would be added are as follows:

1) Any of the existing building loads could easily be raised significantly without impact,

2) This line could serve an additional load of approximately 21,350 lbs/hr if the load were added along the length of the existing 6” underground branch,

3) A significant load could be added near the end of the 6” line if considerations are made to accommodate the added pipe length and

4) Condensate management should be carefully addressed under all but the first of these.

3.9.2.4 *Steam System Deficiencies*

3.9.2.4.1 *Steam Plant*

Regarding capacity, there does not appear to be any significant limitations regarding the addition of loads associated with the present or future buildings identified in the current master plan. The largest deficiency has been ability for existing boilers to turn down sufficiently during low steam demand periods. These conditions are frequently encountered except during the winter. The addition of a fourth smaller boiler with lower turn down capacity will be accomplished in 2015 under an Energy Saving Performance Contract. The addition of VFD’s on the feed water pumps is another aspect of this contract to improve energy efficiency. There are also no redundancies in header piping or main distribution piping leaving the steam plant.

3.9.2.4.2 *Steam Distribution System*

The steam distribution is adequate and would also handle the future loads on either of the two 12” major steam delivery branches, and the 4” branch to Building 31.

Regarding distribution arrangement, consideration should be given to creating loop feed capability to critical facilities. A bypass feed has been installed to serve Building 7 and 28. This bypass allows the 12” steam mains to Building 7 and Building 12 to be isolated while maintaining a supply of steam to the given buildings.

Regarding the age of the piping, several of the direct bury steam mains are now more than ten years old. This combined with the fact that the distribution is entirely a radial arrangement without any parallel feed capability may be of concern. In particular, replacement of the underground steam distribution lines from Building 26 to Building 7 and from Building A south to Building 13 and beyond will be very difficult and disruptive to steam service. Temporary services under these conditions will likely be very costly. Construction of a parallel distribution route of some kind may be prudent from both a reliability standpoint and an economic standpoint. This Master Plan Update proposes that a large new main could be constructed going south from the Building 28 chiller plant and then wrap back to the east to interconnect with the other buildings.

3.9.2.5 *Future Projected Steam Loads*

Due to high fresh air loads, there is potential for an average heating load for the Building B and Building G spaces of as much as 200 Btu/h per square foot. A figure of 50 Btu/h per square foot is more probable for storage Building H and conference Building J. As tabulated above, the combined steam load for these four buildings would total approximately 20,000 lbs per hour.

The boiler plant was expanded with the construction of Building 28 and is designed to allow for the placement of a fourth 50,000 lbs/hr boiler. Although it has not yet been conclusively verified with operational data, it is believed the current plant has the capacity to take on between 20,000 and 35,000 lbs/hr of additional load.

3.9.2.5.1 *Steam Distribution System:*

If Building B is constructed to the south of Building 25, the 6” steam line serving Building 25 has a spare capacity of at least 20,000 lbs/hr, which should be ample for any construction in this vicinity. The capped 12” steam line in the IRF chiller room has enough reserve capacity to distribute steam to any additional loads to the west of the Building 28 IRF.

3.9.2.6 *Recommendations – Steam System:*

If Building B is constructed to the south of Building 25, the 6” steam line serving Building 25 has a spare capacity of at least 20,000 lbs/hr, which should be ample for any construction in this vicinity. The capped 12” steam line in the IRF chiller room has enough reserve capacity to distribute steam to any additional loads to the west of the Building 28 IRF.

3.9.3 Chilled Water System

3.9.3.1 *Chilled Water Plant*

There are two distinctly separate chilled water plants on the RML campus. The original plant is located in Building A on the west side of the Quad Complex in the ground floor mechanical room; known as Building A chilled water system. The other is located in a mechanical room on the southwest corner of Building 28; known as Building 28 chilled water system.

The Building A chilled water plant has a capacity of 1,000 tons. It houses two 1,000 ton electric water-cooled centrifugal chillers and one 140 ton reciprocating split system chiller.

The Building 28 chiller plant has a capacity of 870 tons. It is comprised of one 700 ton electric water-cooled centrifugal chiller, one 700 nominal ton steam-fired absorption chiller and one outdoor air-cooled 170 ton rotary chiller. The capacity of the outdoor chiller is de-rated for altitude and the use of glycol.

There are several buildings on campus that are cooled by local equipment only and are not connected to either chilled water plant. These include Visitor’s Center Building 30, Receiving Building 29, the HD buildings, the ARMCO buildings, and Buildings 8, 9 and 11.

Exhibit 3-30: Existing Chilled Water Plant

3.9.3.1.1 *Chilled Water Plant - Building 28*

The Building 28 chiller system is a hybrid arrangement that includes three different types of chillers. There is one 700 ton electric centrifugal chiller and one 700 ton single-effect lithium bromide steam fired absorption chiller located in the chiller room at the west end of Building 28. The third unit is a 170 ton outdoor air-cooled rotary chiller. The outdoor chiller is situated in the recess between Building 28 and Building 25 along their west side. The outdoor chiller is coupled to the primary chilled water loop with an indoor plate and frame heat exchanger located in the chiller room. The chilled water for the outdoor chiller/heat exchanger circuit is a solution of 60% water and 40% propylene glycol. The main chilled water loop is filled with water using a corrosion inhibitor.

The chilled water plant is designed so that the centrifugal chiller and the absorption unit are redundant to one another. The centrifugal chiller is far more energy efficient than the absorption unit and is intended to operate as the primary chiller. However, it is not connected to emergency power. During interruptions to commercial power the absorption unit will be called upon to carry large cooling loads.

The centrifugal chiller and the absorption chiller are both water-cooled and are connected to two forced draft open cooling towers located on the roof of the chiller room. The towers are each sized to support the cooling load posed by either the centrifugal chiller or the absorption chiller. Only one tower is required to operate at any time.

The smaller outdoor chiller serves as the first stage unit in the operating sequence. The two larger chillers require a sustained load of not less than 70 to 100 tons to begin operation. The outdoor chiller can operate down to a minimum load of around 25 tons and will start first and carry the cooling load until it exceeds approximately 100 tons, at which point one of the larger chillers can start and run. The outdoor chiller is also used along with either the centrifugal or absorption chiller as the third-stage chiller to meet peak plant loads.

The outdoor chiller has the added function of bridging chilled water production during switchover between operations of the two large chillers. This is especially important during a commercial power outage that occurs when the centrifugal chiller is operating. Under these conditions, the absorption chiller is called upon to start. However, the absorption chiller takes a significant amount of time – on the order of 30 minutes – to complete its startup cycle and begin producing significant cooling. During this time the outdoor chiller will start and run immediately in order to provide as much cooling as possible while the absorption unit is “warmed – up” to operating conditions.

The two large chillers and the heat exchanger for the outdoor chiller are connected in parallel to a common primary chilled water loop in the chiller room. Chilled water is circulated through the chillers by two fully redundant primary chilled water pumps. These pumps are large split case type units. Each operates on a variable frequency drive to produce adequate flow for the chillers that are in operation at any given time. Motorized isolation valves stop water flow through inactive units and throttle the flow to the appropriate flow rate through the active chiller and/or heat exchanger. Only one primary pump is required to operate at a time for any of the flow scenarios.

The extent of the primary chilled water loop is confined to the chiller plant. Each building connected to the plant utilizes its own remote secondary chilled water pumps to circulate water to and from the primary chilled water circulation loop in the chiller room.

As part of the Data Center Project this chiller plant will be upgraded to replace the absorption chiller with a 1000 ton electrical centrifugal chiller and the air cooled unit with two new 200 ton air cooled units with free cooling economizers. This project is currently under design.

3.9.3.1.2 *Chilled Water Plant - Building A*

The Building A chilled water plant was renovated in the year 2008. When constructed, and until the 2008 renovation, this plant housed two nominal 400 ton single effect lithium bromide steam fired absorption chillers. Additionally, a nominal 140 ton split system chiller had been added in the year 2004 to accommodate light loads. Under the 2008 upgrade project, the two 400 ton absorption chillers were removed and replaced with two new dual-compressor variable-speed 1000-ton electric centrifugal chillers. A third primary chilled water pump was also added during the renovation. The 140 ton split system electric reciprocating chiller was left in place and acts as the first stage cooling device. However, unlike the Building 28 plant, the small chiller does not act as third stage cooling nor does it figure into the plant's overall peak capacity. The large chillers in this new system are designed to be 100% redundant, with only one of the 1000-ton chillers operating at a time.

The plant continues to utilize the two existing open draw-through counter flow outdoor cooling towers located just west of Building 31. Each of the two towers is rated to accommodate one of the 1,000 ton chillers. Only one tower operates at any given time. The north cooling tower was installed as part of the Quad renovation around the year 2000. The south tower was added as a redundant backup in the year 2004.

The condenser water pumps for this plant are located remotely in a small pump house immediately adjacent to the cooling towers; just east of Building 26 and just west of Building 31. The two towers and the two condenser water pumps are redundant. The active condenser water pumps circulate cooling water through the active cooling tower, to the active chiller in the plant and back again. The pumps and the cooling tower fans are served by individual variable frequency drives. The pumps and their VFD's were installed as part of the 2008 plant upgrade.

Like the Building 28 chilled water plant, the pumping arrangement for this plant is a primary-secondary system. However, it differs slightly from the Building 28 arrangement in two regards. First, three smaller primary chilled water pumps are utilized instead of two large pumps. Only one pump is required to operate when only the small reciprocating chiller is active. Two of the three pumps are required to operate together whenever one of the large centrifugal chillers is operating. The third pump acts as a standby in the event of a pump failure.

The other major difference in pumping arrangements between this plant and the Building 28 plant is the fact that in the Building A plant, a central set of secondary chilled water pumps are used to serve all of the connected buildings rather than each building having its own set of secondary pumps. The secondary chilled water pumps are located in the chiller room of Building A. They are each served by their own variable frequency drive but operate together to satisfy a differential pressure sensor located in the air handling penthouse of Building A. The pumps are redundant or N+1.

3.9.3.2 *Chilled Water Distribution System*

The plant located in Building A currently serves the Quad complex and Buildings 12, 13, 13B and Building 32. This system is also known as the Building A chilled water system.

The plant located in Building 28 serves Building 25, Building 28 and Building 31. This system is also known as the Building 28 chilled water system.

Refer to Exhibit 3-30.

3.9.3.2.1 *Chilled Water Distribution – Building 28 Chilled Water System*

There are two sets of secondary chilled water lines that leave the Building 28 chiller plant. A pair of 6” supply and return lines leaves the plant through a pit in the southeast corner of the plant and extends underground to the mechanical room of Building 25. A pair of 10” supply and return lines leave the chiller plant heading east through an under floor pipe gallery that extends all the way to the east end of Building 28. There, the 10” secondary supply and return lines split to serve both Building 28 and Building 31.

The secondary chilled water pumps for Building 28 are located in the ground floor mechanical room near the east side of the building. The secondary pumps for Building 31 are located in the basement mechanical room of that building. The secondary pumps for Building 25 are located in the ground floor mechanical room at the west end of Building 25.

Chilled water serving Building 25 is piped underground to the ground floor mechanical room. There, two redundant chilled water pumps circulate chilled water to the cooling coils of a single air handler that is situated in the interstitial space of the building and then back underground to the Building 28 chiller room. The underground direct-bury piping system used for this service is Ricwil “Poly- therm” and is comprised of a schedule 40 steel carrier pipe with foam insulation and an FRP (fiberglass reinforced plastic) outer jacket. The underground piping was installed as part of the Building 25 construction project in the year 2000 and was modified with the Building 28 construction in the year 2007. Its expected lifespan is on the order of 20 to 40 years.

The underground piping used to serve Building 31 is similar to that used to serve Building 25. However, it uses a high density polyethylene outer jacket instead of FRP. The product name is

"Ferro-Therm" and is manufactured by Thermacore Process. The piping was installed in the year 2008. The life expectancy of this pipe is also 20 to 40 years.

3.9.3.2.2 *Chilled Water Distribution – Building A Chilled Water System*

The chilled water produced by the Building A plant is piped to all of the air handlers serving the Quad buildings. These currently include Building A and Buildings 1, 2, 3, 5, 6 and 7. Additionally, a 6" piping loop (supply and return) extends underground from Building A to serve Building 12, Building 13, Building 13B and Building 32. The underground piping is routed out the west side of Building A and then south. The line splits at Building 13B. A 6" branch splits off into Building 13B; and the main branch remains 6" in size and extends south to Building 12. There, the 6" lines dead end and 4" branch lines enter the Building 12 mechanical room. If Building 12 is demolished, then the chilled water system will need to be rerouted. The branch line entering Building 13B serves the air handlers for Building 13B, and the large air handler for Building 13. It then exits the building, still 6" in size, and goes back underground outside the mechanical room on the west side of Building 13. The underground line extends west to Building 32 along the south side of Building 25. Between Building 13 and the east side of Building 25, the chilled water piping is 6" is size. It then reduces to 3" in size and extends to Building 32.

The original portion of the underground distribution piping for this system was installed between 1997 and 2000 with the renovation of the Quad complex. This portion of the piping system is Ricwil "Poly-therm" comprised of a schedule 40 steel service pipe with foam insulation and FRP (fiberglass reinforced plastic) outer jacket. It has an estimated lifespan of 20 to 40 years. The underground piping between Building 13 and Building 32 was installed in 2008 and is the same product as used to serve Building 31; Thermacor "Ferro-Therm".

3.9.3.3 *Capacity*

3.9.3.3.1 *Capacity – Building 28 – Chilled Water Plant*

The system serving Building 28 has a nominal equipment installed capacity of 1570 tons (18,840,000 BTUH). It is comprised of one 700 ton electric water-cooled centrifugal chiller, one 700 nominal ton steam-fired absorption chiller and one outdoor air-cooled 170 ton rotary chiller. Following de-rating of the air cooled chiller for glycol, altitude, water flow rate, etc., the actual installed capacity of the system should be approximately 1550 tons (18,600,000 BTUH).

Please note that the calculations for the plant installed capacity of 1550 tons include the capacity of the outdoor air cooled chiller which does not have a redundant counterpart. Should this unit fail during a commercial power outage, the plant firm capacity would be only 700 tons and load shedding of Building 31 would need to take place during extreme summer conditions.

3.9.3.3.2 *Capacity - Building A - Chilled Water Plant:*

The two large centrifugal chillers in Building A each have a nominal capacity of 1000 tons and the smaller split system reciprocating chiller has a capacity of 140 tons. Due to the primary pump arrangement, the plant installed capacity is regarded as 2,000 tons, and firm capacity is regarded as 1,000 tons; the plant installed capacity less one large (1,000 ton) chiller. The current estimated demand load for this system is approximately 790 tons.

The demand load estimate for this plant is based on the load profile tabulated in

Exhibit 3-31. The current estimated connected load for the Building A Chilled water system is approximately 790 tons.

The loads listed for Buildings 1, 2, 3, 5, 6, A, 12 and 13 are based upon the original design loads; and then escalated for incoming air temperatures of 100 degrees versus the original design temperature of 92 degrees. Outdoor air temperatures in July of 2007 topped 100 degrees at some point on at least five days. Observed loads since that time bear out the accuracy of these figures. The loads for Buildings 13B and 32 are based on installed equipment capacity. The load for Building 7 is based on a laboratory application.

3.9.3.3.3 *Capacity - Building 28 - Chilled Water Distribution System:*

The estimated loads on the Building 28 chilled water system are 600 tons for Building 28, 120 tons for Building 25 and 110 tons for Building 31 for a cumulative load of 830 tons.

3.9.3.3.4 *Capacity - Building A - Chilled Water Distribution System:*

The current estimated connected load for the Building A Chilled water system is approximately 790 tons.

The loads listed for Buildings 1, 2, 3, 5, 6, A, 12 and 13 are based upon the original design loads; and then escalated for incoming air temperatures of 100 degrees versus the original design temperature of 92 degrees. Outdoor air temperatures in July of 2007 topped 100 degrees at some point on at least five days. Observed loads since that time bear out the accuracy of these figures. The loads for Buildings 13B and 32 are based on installed equipment capacity. The load for Building 7 is based on a laboratory application.

Exhibit 3-31: Building A Chilled Water Distribution Estimated Cooling Load Table

Building	Estimated Cooling Load (TONS)
Building 1	31
Building 2	85
Building 3	176
Building 5	50
Building 6	105
Building 7	50
Building A	87
Building 12	10
Building 13	130
Building 13B	34
Building 32	32
Total, existing & near future	790 tons

3.9.3.4 *Deficiencies – Chilled Water System*

3.9.3.4.1 *Deficiencies - Building 28 - Chiller Water Plant:*

The following are items of potential concern for the Building 28 chiller plant:

(1) The 700 ton centrifugal chiller is on emergency power. This presents the predicament that if the absorption chiller is down for maintenance, a commercial power outage would leave the plant with no large tonnage chiller available at all. This would leave the plant with only the small air cooled chiller to operate and a mere fraction of the capacity needed to maintain tenable animal room conditions.

(2) The air cooled chiller does not have a redundant counterpart. If this unit is down for maintenance and a commercial power outage occurs, the plant capacity will be limited to that available from the absorption chiller. The time lag involved in getting the absorption chiller up to operating conditions may not be manageable under these conditions.

(3) A known concern at the current plant is the ability to produce chilled water immediately upon disruption of commercial power because the absorption chiller can take up to 30 minutes to warm up to operating temperature.

3.9.3.4.2 *Deficiencies - Building A - Chiller Water Plant:*

There are no known Building A chiller plant deficiencies.

3.9.3.5 *Future Loading – Chilled Water System*

The Master Plan depicts construction of a number of new facilities in the next twenty years. Some of these facilities such as Laboratory Building G, and animal housing Building B and Building L are central to research and would have relatively large heating and cooling loads and would require redundant sources of heating and cooling. If built, these should be connected to the central steam and chilled water systems for reliability and overall campus plant efficiency. The Master Plan also depicts construction of several non-program type facilities. These, too, could be connected to the central steam and chilled water plants but, because they do not necessarily have the same demand for fully redundant services, are good candidates to be heated and cooled by local equipment in a similar fashion to what is done at the Visitor Center and Receiving buildings. These facilities include the new maintenance facility complex (Building C), Waste Marshalling and Vehicle Storage Facility (Building D), and Interpretive Center (Building K). These buildings appear to be good candidates for the use of green building technologies such as ground water cooling, ground loop heat pumps, condensing gas boilers and/or solar thermal heating.

Using typical NIH design criteria and prevailing climatic conditions, the approximate heating and cooling loads posed by the future core buildings depicted in the Master Plan are listed below (see Exhibit 3-32). It is assumed that Buildings B and G would be connected to the central chilled water and steam systems due to their need for redundancy and high reliability. Buildings H and J could either be served by local equipment or because of their connection to Building 31, by the central campus systems.

Exhibit 3-32: Projected Building Heating and Cooling Loads Table

Building	Use	Area	Heating Load[1]	Cooling Load[2]
Building B	Animal	34,315 gsf	6,863 MBH	3,088 MBH (264 tons)
Building G	Laboratory	70,000 gsf	14,000 MBH	6,300 MBH (525 tons)
Building H	Laboratory	13,140 gsf	2628 MBH	1183 MBH (99 tons)
Building J	Conference	10,000 gsf	500 MBH	250 MBH (21 tons)
Building 31[3]	Computational	3450 gsf	Negligible	2208 MBH (184 tons)

[1]Heating loads based on 200 BTUH per gsf for labs and animal facilities, 50 BTUH per gsf for storage and conference.
[2]Cooling loads based on 90 BTUH per gsf for labs and animal facilities and 25 BTUH for storage and conference.
[3]The Building 31 renovation (of 3450 gsf of basement area) will increase the cooling load by a maximum of 184 tons per the addition of a Computational Center (per the A&E Architects and team study completed on March 10, 2015), while the heating load will be considered negligible.

3.9.3.6 *Recommendations – Chilled Water System*

Fundamentally, the following items are thought to be essential steps towards chilled water sufficiency in the campus Master Plan build out and are listed in order of priority.

1) Establish emergency power provisions for the 700 ton centrifugal chiller in the Building 28 chilled water plant in order to establish a true redundancy in the primary chillers.

2) Investigate and implement a means to provide the equivalent of thermal storage at the Building 28 plant for at least twenty minutes in order to sustain chilled water capacity while the absorption chiller is started. This could be accomplished in at least four different ways: replace the absorption chiller with a centrifugal chiller, install a 6" crossover line from the Building A chiller plant to the Building 28 plant, install a thermal storage system or install a groundwater cooling solution. *Per RML staff, the recommendation to replace the absorption chiller is being addressed.*
3) As an alternate approach to the item listed above, construct a large tonnage outdoor air cooled chiller adjacent to the Building 27 generator building and connect it to both chilled water plant distribution systems. Size the plant at 500 tons minimum so that it could minimally support the animal housing loads of either plant.
4) Increase the Building 28 chilled water plant capacity to 1600 tons, add a third cooling tower, a third primary chilled water pump and a third condenser water pump. Interconnect the distribution from Building 28 to the Building A plant distribution at the south side of Building 25. This would allow the Building 28 chiller plant to support Laboratory Building G, Animal Building B, or both, and to act as a backup to Buildings 13 and 32. *Per RML staff, this recommendation is being addressed.*
5) Establish a plan for systematic replacement of the direct-bury chilled water piping on campus beginning with the lines on the west side of the Quad complex, the oldest lines on campus. This should include the 12" condenser water lines to the cooling towers that serve the Building A chiller plant. Replacement plans should also include cooling towers and other equipment with a normal 20 year life span.

For an illustration of the projected chilled water distribution, refer to Chapter 4.

3.9.4 Compressed Air and Vacuum Distribution Systems

3.9.4.1 *Underground Distribution Piping*

These two piping systems extend from Building 7 into Building A. A branch line that serves the underground distribution leaves the west side of Building A then turns southward in the alley between Building A and Building 13 to serve Buildings 13, and 13B. The two services (air and vacuum) parallel one another and serve the same buildings. Despite their similarities, the capacities of these two systems to accommodate additional loading vary quite significantly. These services are routed just west of the Quad complex and extend to the south where they now terminate their services at Building 13B. The mains remain undiminished in size from Building A to their terminus.

3.9.5 Energy Monitoring and Controls Systems

The building control systems on the RML campus are a mixture of new direct digital controls (DDC) and older, local pneumatic and local electric controls. All of the DDC control systems on campus are less than 6 years old, are manufactured by Siemens, and are networked to front end units located in Building 28 and T23. The Siemens operators' terminal features color graphics for all of the connected systems. In addition to featuring graphics for each HVAC system, the main operators' terminal has separate graphics pages for monitoring and alarming the central chillers in Building A, the boilers in Building 26 and all of the (5) emergency power generators on campus.

New DDC systems by Siemens serve Buildings A, 1, 2, 3, 5, 6, 7, 12, 13, 13B, 23, 24, 25, 26, 27, 28, 32 and Armco II. The Siemens DDC system was installed on the major buildings several years ago and is the only control system on campus. Local electric are used in Armco 1, HD-1, HD-2, HD-4 and HD-5, T23 and Buildings 8, 9, 11, 22 and 23.

Temperature Controls Compressed Air Supply Systems: Most of the buildings on campus receive air for temperature control actuation from dedicated air compressors resident in each building. Aside from the Quad buildings and Buildings 13 and 13B, which receive their temperature control air from the compressor in Building 7, all of the other campus buildings which require compressed air for controls have their own compressors.

3.9.6 Water Distribution

Refer to Exhibit 3-33. The RML Campus has a single 12-inch diameter connection to the City's water system at 4th and Grove Streets. The main to the meter pit located adjacent to the roadway, is 12-inch diameter PVC. A water meter assembly (two meters) is located in the pit and maintained by the City. The water service building, which houses two, 8-inch diameter reduced pressure back flow preventers and a 1,400 gpm booster pump system is located approximately 50 feet downstream from the meter pit. A 12-inch diameter main leaves the water service building. The booster pump system boots pressure to minimum 65 psi. The 1400 gpm design flow provides for 1,000 gpm for fire flow and 400 gpm for campus use. The potable water distribution system is approximately 6710 linear feet of pipe.

The backbone of the RML distribution system consists of three interconnected 10-inch PVC mains loops that provide bi-directional feed to most of the buildings. This Loop system is connected to 12-inch main from the Water Service Building. The average water usage since August of 2005 is approximately 73,400 gallons per day or 51 gallons per minute (gpm). The maximum monthly usage of 110,326 gpd was in July 2013 that account for new IRF Laboratory, Building 28 which amounts to 72.4 gpm. The design peak instantaneous usage within the building using peaking factor 0f 4 will be approximately 300 gpm.

The 12-inch and 10-inch diameter PVC water mains were installed since 1995 and are in good condition. There are thirteen fire hydrants located throughout the Campus. Almost all of RML buildings have had new water and fire sprinkler service connections installed with improvement projects since that time.

There is an active 6-inch water main located in 4th Street that passes through the campus that is owned by the city. This main is located inside the RML campus but no campus facilities are connected to it.

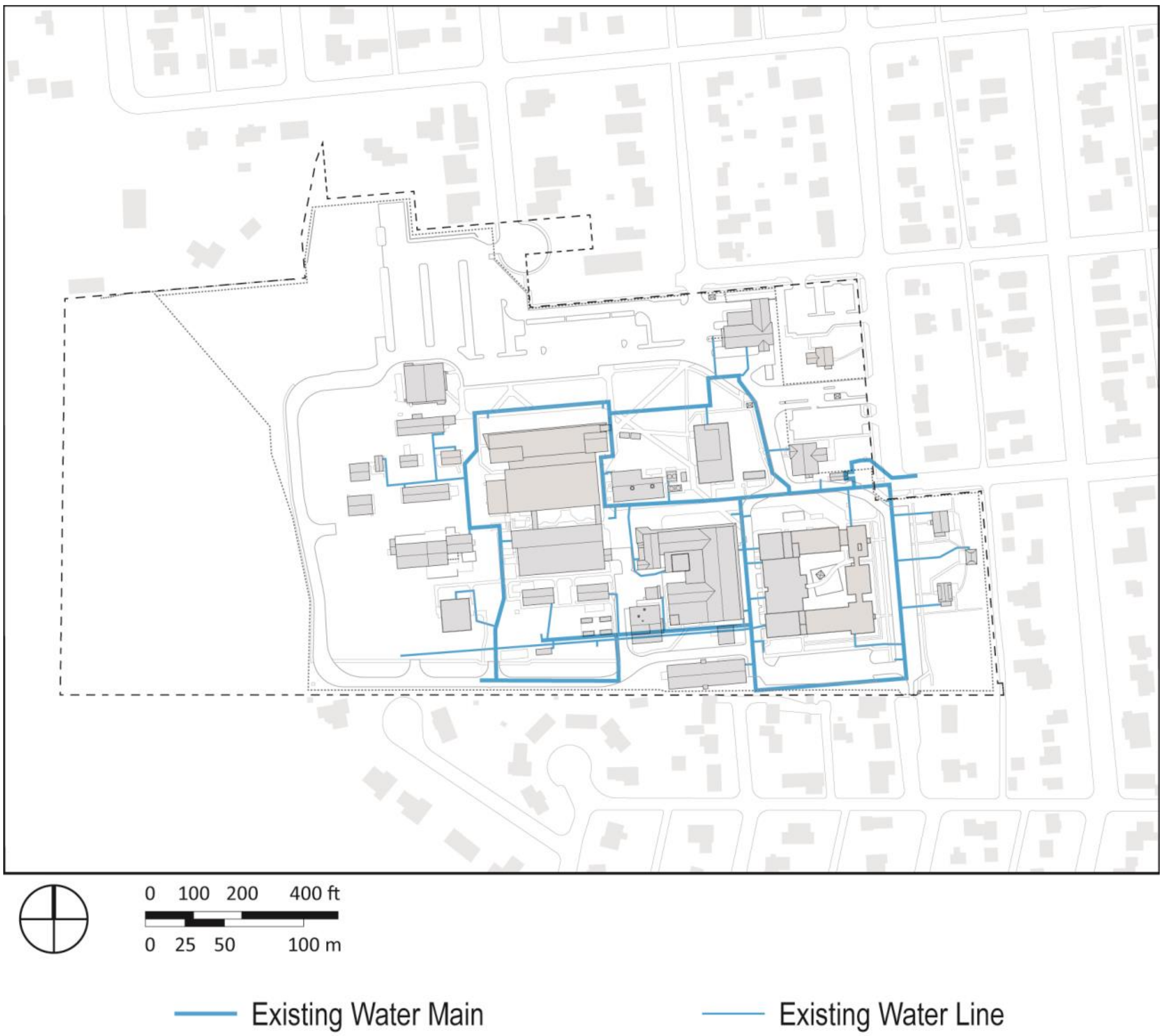

Exhibit 3-33: Existing Water Distribution

3.9.6.1 *Deficiencies*

RML campus existing water distribution system has only one connection to the city water system. That leaves RML vulnerable shutdown to in case of failure. Therefore a second connection would provide some level of redundancy. However, there are significant complications arising from a second connection. Any connection to the City system requires reduced pressure backflow preventers and metering. These backflow preventers reduce the pressure enough that booster pumps would be needed to get the system pressure back to operating pressures. Also, the billing for water as a utility is based largely on the connection size. A second connection would be a constant cost, even if no water were used. Locating the needed facility for this connection becomes problematic. Alternatively the second connection could be used only in an emergency. A 10" DIP is stubbed out near the north perimeter to facilitate a second connection in the future. It must be recognized that a second connection would only be useful in the event of a failure of certain pipelines, not a fundamental failure of the City water system.

3.9.6.2 *Recommendations*

RML campus currently has only one feed from City of Hamilton. It is recommended to install second connection northwest of Building D to reliability/redundancy in case of failure.

3.9.7 Sanitary Sewer Collection System

Refer to Exhibit 3-34. The RML has a conventional gravity collection system consisting of 8" diameter sewer mains and 4' diameter concrete manholes. The manholes are located at pipe junctions and changes in pipe direction. The manholes are all less than 400 feet apart. The RML has four connections to the City of Hamilton's sanitary sewer system. The first connection 'A line 'is in the alley on Baker Street between 5th and 6th Streets. This sewer main is an 8" PVC main which serves most of the RML buildings on eastern end of the campus. The sanitary sewer system was installed in Hamilton in the early 1950s.

The second connection 'B' line is at what would be the alley between 6th and 7th Streets. This 8" PVC main was installed in the mid-1980s and serves facilities at the western end of the campus and Building 25. This line is at or near peak flow capacity during short peak flows. There is a third connection, ''C' line at the intersection of 5th and Baker Streets Serves buildings to the north eastern side of the campus. This is an 8" PVC pipe that was installed in 2005. This line connects to a City sewer line that is only 6-inch and includes a 90 degree turn in the first manhole off campus. This line is substandard per Montana Department of Environmental Quality design. The fourth connection is in the alley behind Building 11, and connects only to this building. Its size and composition are undetermined.

Most of the sewer mains at the RML are at or near 0.4%, the minimum grade. It is difficult to make changes in the sewer main routing, since existing mains are at minimum grade. Also, the City mains to the north are at minimum grade. An 8-inch PVC sewer main laid at minimum grade has a maximum capacity of 346 gpm. The projected peak water usage under the 20-year growth option is projected to be approximately 388 gpm. Therefore, the capacity of any one of the three-sewer main connections to the City is nearly adequate to handle the projected peak usage for the entire campus. Depending on how future demands are distributed among the sewer connections, water usage at the RML Campus could conceivable double without triggering a need to increase the capacity of the on-campus wastewater collection lines.

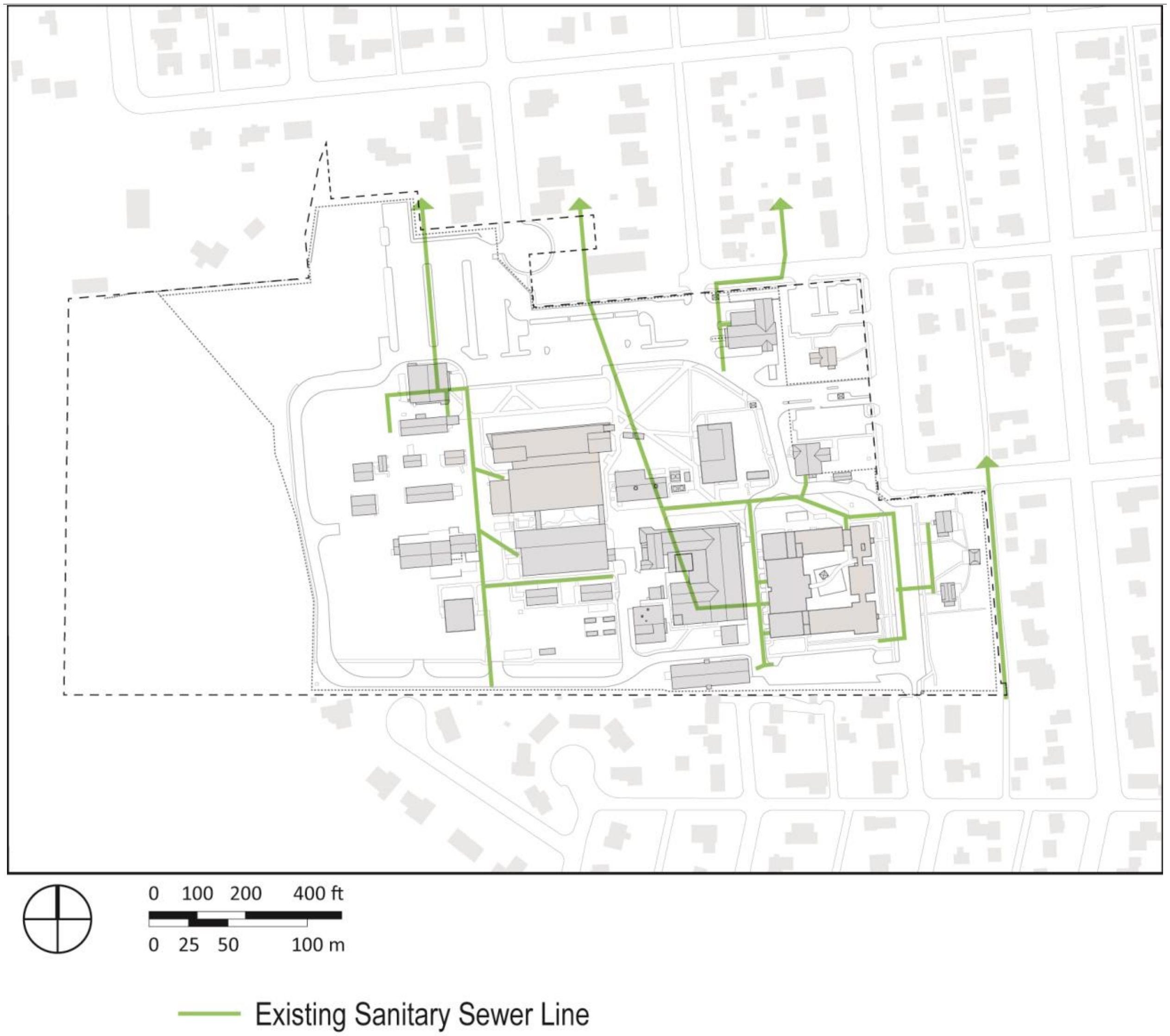

Exhibit 3-34: Existing Sanitary Sewer

3.9.7.1 *Deficiencies*

The existing sewer main connection "B" line is at near peak flow capacity during short peak flows. The connection "C" line connects to a City sewer line that is only 6-inch and includes a 90 degree turn in the first manhole off campus. This line is substandard per MDEQ design for future reference.

3.9.7.2 *Recommendations*

It is also recommended that RML adopt a three to five year recurrence sewer main cleaning program.

3.9.8 Storm Sewer

The RML campus has one pipe which daylights at the west end of campus. The southerly pipe which runs just inside the RML's south boundary is an overflow pipe for the irrigation pipe system in the alley between 3rd and 4th Streets. No water from RML runs in this pipeline. It is currently still active in the summers. Storm water on campus is managed through dry wells/sumps or swales. The State of Montana has issued a Montana Pollutant Discharge Elimination System (MPDES) permit to the RML for discharging boiler blow-down and cooling water to the Bitterroot River. The permit listed two discharge points. The permit expired on November 30, 2002 and has not been renewed since RML no longer disposes of boiler blow-downs and cooling water in the pipes on campus and these pipelines have been directed to drywells. They no longer conncet to the previous discharge point.

The Phase II storm water regulations under MPDES Permit System (Storm Water Discharges associated with Small Municipal Separate Storm Sewer Systems) apply primarily to areas with populations of at least 10,000. However, the rule also includes other areas such as military bases, large educational, hospital and prison complexes and highways and municipalities with less than 10,000 people depending on the receiving water designation. Currently, only construction activities that disturb more than 1 acre at RML are subject to MPDES Phase II rules (primarily Best Management Practices for erosion and sediment controls)." [REF: MPDES Permit Number: MTR 040000]

Considering the likelihood that both Hamilton and RML would be included under additional Phase II requirements within the 20-year time frame of the Master Plan, NIH will adopt a proactive storm water management approach incorporating storm water Best Management Practices (BMP) and Low Impact Development (LID) strategies. These methods are described in more detail in Chapter 5.

3.9.8.1 *Drainage System*

An 8" pipe from Building 7 used to convey boiler blow-down water under Building 13 into a12" diameter drain beginning on the west side of Building 13. The original 12" diameter corrugated metal pipe (CMP) was replaced by PVC pipe to the section west of Building 25. The drain line terminates in a series of drywells. This pipeline also has six storm water intakes, two each between Buildings 22 and 25 and four each west of Building 25 on the westerly section of pipe. The portion of drain line from the outfall to the first manhole has been disconnected. The remaining of this drain is 12" PVC installed recently under current construction projects. This pipe is in good condition. This pipe is one of the discharge points listed in the expired MPDES permit. The pipe capacity is 2.9 cfs.

3.9.8.2 *Storm Water Management*

Most of the storm water on the RML site is disposed of in dry wells (sumps) and shallow drainage swales, which percolate the water into the ground. The Bitterroot Valley soils have good drainage characteristics so sumps are good methods of storm water disposal. Normally a 4' diameter x 8' deep sump is designed to drain a 10,000 square foot surface area. The State of Montana does not require permits for storm water discharged into the ground..

3.9.9 Electrical Building Systems

3.9.9.1 *Primary Campus Distribution*

The electric power for the Rocky Mountain Laboratories (RML) in Hamilton, Montana is obtained from Northwestern Energy. Northwestern Energy feeds RML from a single substation located seven miles south of campus. The campus main electrical service point is located in the Northwest corner of the campus. A Utility Company pad mounted manual switch located in that corner of the campus has two input switches and one output circuit breaker. The first inputs are connected to an existing overhead line "backup" which parallels the north side of the campus. This line used to be the one of the primary feeders to the campus. In the summer of 2010, the second underground primary feeder was installed directly from the same utility substation on the south of town. That feeder is identified as the "Express Feeder". The express feeder is a dedicated feeder which serves only RML campus. The new service comes into the campus through a primary switch that can manually switch from the new express feeder or the other overhead feeder identified as a backup. From the pad mounted switch, the electrical service runs to a pad mounted metering equipment with current transformers along with input and output manual switches. The Utility Company metering can be found at this location. The service electrical characteristic are 12,470 volts line to line, 7,200 volts line to neutral, three phase, 60 Hertz, grounded wye.

From Utility owned pad mounted metering equipment; the electrical service runs underground to a RML pad mounted enclosure with one isolating input switch and three output circuit breakers. In the enclosure one circuit breaker is a spare, one circuit breaker was provided to serve the East Distribution System and one circuit breaker currently feeds the West and Building 28 Distribution System. A third breaker feeds a smaller transformer that provides power for the trailer complex T-23 and power for the construction trailers. The East Distribution System is currently fed from a Northwestern Energy aerial line located to the north of RML campus.

There is a project under construction called Generator Relocation that will change the power distribution system for the RML campus. The Generator Relocation project will change the existing primary distribution from a radial distribution system to a primary open loop system. The loop system allows the East and West campus to be connected by a 12,470 volt loop around campus using normally open/close switches. The loop distribution system consists of new pad mounted switches, ductwork and cables to improve system reliability, continuity and aid in future expansion. The Generator Relocation single line is shown in Architects Design Group PC (ADGPC) Drawing E3.2. The Generator Relocation project is scheduled for completion in 2015 October.

Under the Generator Relocation project, the RML pad mounted switch will feed the projected new medium voltage distribution equipment “DSG” to be located in the Building 27 expansion. Underground feeders to the pad mounted IRF Building 3000 kVA, West 2500 kVA and the East 2500 kVA transformers will be connected to the distribution switchgear “DSG”.

The new medium voltage distribution switchgear “DSG” and paralleling switchgear “PSG” in the Generator Relocation project will supply both utility and standby generator power to the campus electrical distribution system. This will consolidate the normal and emergency power in a single location. If the utility power is disrupted, the emergency generator sets will start and transfer equipment will disconnect the campus from the utility company service and connect the campus to the standby generator power system. The RML campus will continue to be powered from the generators until utility power returns. At which time, the campus will be transferred back to the utility power.

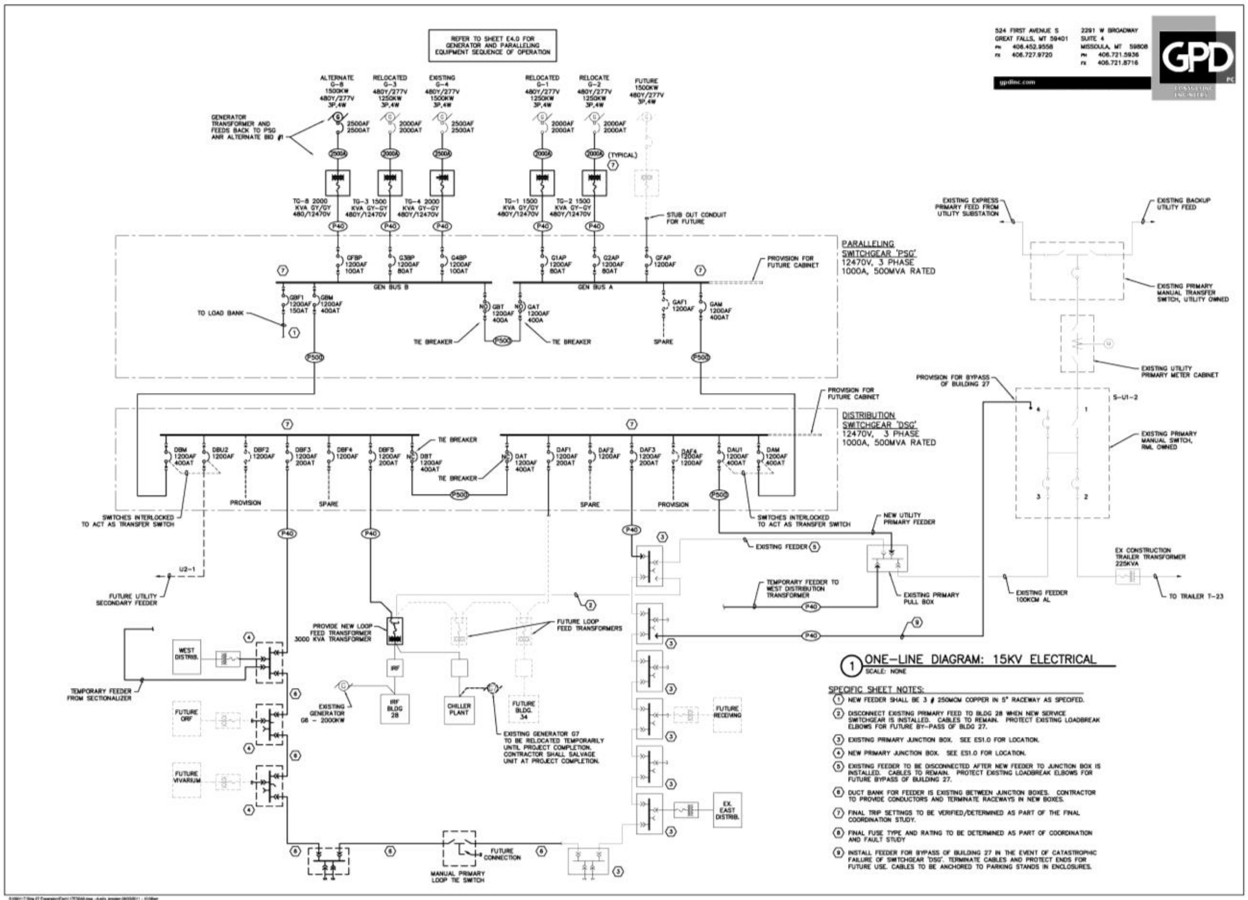

Exhibit 3-35: Building 27 Expansion Single Line

3.9.9.1.1 *Capacity*

The Northwestern South Substation has a 20 MW supply capability. There are two lines feeding the campus from the South Substation. One overhead line feeds the area residence and portions of the RML campus. That line is approaching its capacity. The second line is an Express line feeding directly to the RML campus and can deliver 7.5 MW. The total connected capacity of RML is 7000 kW based solely on the total utility transformer rating. The connected load for the campus is approximately 4000 kW during peak cooling.

3.9.9.1.2 *Deficiencies*

There is concern that the 20 MW supply capability from the south substation of Northwestern Electric may not be enough to handle the increased loads that may come in the future.

3.9.9.1.3 *Future Loads:*

Future loading for RML campus is expected to be between 1550 – 2200 kVA over the next 20 years.

3.9.9.1.4 *Recommendations*

Since the Northwestern south substation feeds the area residence and RML, there is a concern that a possible capacity issue will occur. Therefore, the south substation 12 MW capacity should be increased to 20 MW to accommodate the future load increase that could be between 1550 – 2200 kVA. Currently upgrades are being done on the south substation to increase capacity for future growth.

3.9.9.2 *East Distribution System*

The East Distribution system receives its power from the Building 27 power plant through the underground 12,470 V distribution system to the utility transformer. The East Distribution system in Building 7 the East Distribution is a 277/480-volt distribution system. The East Distribution system consists of a 2500 kVA padmount transformer and a Main Service Distribution “MSB”. The main switchboard MSB then serves three other switchboards labeled MSB7, MSB7A and MSBA1.

The loads associated with the East are as follows:

- Switchboard MSB-A1
  - Buildings A, 1, 2, 3, 5, 6, 8, 9, 11
  - Quad Air Handling Unit
- Switchboard MSB7
  - Buildings 7, 29, 30, 31, Water Service
- Switchboard MSB7A
  - (2) 1000 ton Centrifugal Chillers
  - Building A Chiller Plant
  - Cooling Towers

Under the Generator Relocation project, the East Distribution system will be fed from the new distribution switchgear “DSG” located in the new Building 27 Expansion area. The Expansion project will also relocates generators G1, G2 and G3 into the new Building 27 space. With the use of new paralleling switchgear PSG, the emergency power will be centralized in a single location for the campus.

3.9.9.2.1 *Capacity*

The utility company transformer rated 2500 kVA delivers power to the main switchboard MSB which is rated for 277/480 volts 4000 amps. MSB then feeds switchboards MSB-A1, MSB7 and MSB7A rated 277/480 volts 2000 amps each. Meter readings from Northwestern Energy revealed the peak electrical load for the East Distribution to be 1400 kW on July of 2009.

3.9.9.2.2 *Deficiencies*

MSB-A1 and MSB7A are both somewhat limited for growth by only having overhead access to the switchboards for additional feeders. There is limited spare capacity in the underground ductbanks in the roadway area between the Quad Complex and buildings 13 and 12.

3.9.9.2.3 *Future Loading:*

The projected future loads for the East are computational research/ wet lab (Building H, seminar rooms (Building J) interpretive center (Building K), waste and hazardous material vehicle storage facility (Building D).Based on the July 2009 reading of 1400 kW, the existing and new loads will have a total peak load of 1500 -1700 kW. The new loads could mean an additional 300 – 500 kVA.

3.9.9.2.4 *Recommendations:*

Based on the 2009 reading and the 20 year growth plan, the 2500 kVA transformer should be capable of supporting the projected East Distribution growth plan. The lack of spare capacity in the underground duct banks would be addressed on a case by case basis as new buildings are introduced on campus.

3.9.9.3 *West Distribution System*

The West Distribution system was installed to provide additional power to accommodate the increased load created during past renovations and expansions. The West Distribution system includes a 2500 kVA Northwestern Energy transformer that feeds the west campus. The transformer then feeds normal switchboard WMSB rated 4000 amps 277/480 volts 3 phase 4 wire and a 2000 amp automatic transfer switch (ATS) tied to generator G4 which are all located in building 27. The ATS feeds emergency switchboard WEMSB rated for 2000 amps. Generator G4 has a capacity of 1500 kW, but would typically be rated for 80% of this load, or 1200 kW. Recent readings taken for the MUP indicate a demand load of 1000 kW on this generator. With the exception of the Building 26 feeder, all other loads being fed from the West Distribution are fully backed up by the emergency generator.

Building 26 has its own dedicated generator, designated G5, located in Building 26. It has a capacity of 300 kW, but would typically be rated for 80% of this load, or 240 kW. It is connected to the normal power distribution board in Building 27. Readings taken in year 2009 for the MUP indicate a demand load of 150 kW on G5 generator; however, that will likely change when Building 31 is completely operational. The demand load for the West Distribution system has been estimated to be 1000 kW. In August 2007, there was a peak demand of 1200 kW but the 200 kW spike was attributed to a temporary rental chiller used on Building 13 during that time period. Emergency power for the West is supplied by generators G4 and G5.

The West Distribution system serves the following loads:

- HD Complex (HD-1, 2, 3, 4, 5)
- ARMCO Buildings 1 & 2
- Hazmat Building 1 & 2
- Building 12, 13, 22, 23, 25, 26, 27

As part of the Generator Relocation project, normal power for the West Distribution system will be 12,470 volt power from new distribution switchgear DSG. After the 2500 kVA utility transformer, the 480/277 volt power is distributed to West Service switchboard WMSB and then to distribution switchboard WEMH1. Also with the Expansion project, the generator G4 will be relocated to paralleling switchgear PSG to further the consolidation of emergency power. Generator G5 will continue to serve building 26 exclusively.

3.9.9.3.1 *Capacity*

The West Distribution system consist of Utility Company transformer rated 2500 kVA. The WMSB switchboard is rated 4000 amps and switchboard WEMSB is rated for 2000 amps. A recent reading from Northwestern Energy has the peak load for the system at approximately 1400 kW.

3.9.9.3.2 *Deficiencies*

The capacity of the emergency power system is limited by generator G4 1500 kW and the 2000 amp WEMSB switchboard. At present, the MUP states that the distribution is approximately 80% of its existing capacity and 93% of its emergency power capacity.

3.9.9.3.3 *Future Loading:*

The projected future loads for the West are veterinary branch (Building B), maintenance shop and storage (Building C) and BSL 2 and 3 laboratory and vivarium (Building G). The future loads could add an additional 900 – 1200 kVA to the West.

3.9.9.3.4 *Recommendations:*

The emergency power capacity issue is being resolved with the Generator Relocation project. That project will consolidate generators G1, G2, G3, and G4 in one central location to power the entire campus. The generators will supply power to paralleling switchgear PSG and then feed distribution switchgear DSG to increase the emergency power capacity.

3.9.9.4 *Building 28 Distribution System (Integrated Research Facility)*

This distribution system consists of a main building and attached chiller plant. The original intent was for the Utility Company to provide separate transformers to the location; however, a single transformer was installed because of the present demand. Another transformer will be installed when the chiller plant load exceeds the capacity of the existing transformer. The existing Utility Company transformer is rated 3000 kVA at 277/480 volts. Emergency power for the building is supplied by a 2000 kW generator (G6) and there are provisions for a portable generator if G6 fails or undergoing maintenance. The chiller plant has its own emergency generator (G7) rated 600 kW.

3.9.9.4.1 *Capacity*

The Utility transformer feeds switchgear SSA rated 3200 amps at 277/480 volts and switchboard MSB-28C rated 2500 amps at 277/480 volts. In 2009, building 28 was partially loaded with a reading of 800 kW at the building and 620 kW at the chiller plant. The combined peak measured demand load was 1380 kW. Generator G6 feeds switchboard ESB-C rated 4000 amps and G7 feeds switchboard ESB-B rated 800 amps.

3.9.9.4.2 *Deficiencies*

At the time of this study, no limitations or deficiencies are identified.

3.9.9.4.3 *Future Loading:*

As renovations occur on the West Distribution system, there is a possibility that an additional centrifugal chiller maybe needed. An additional chiller would necessitate a need to increase the emergency generator G7 beyond 600 kW. That could add another 500 – 700 kVA of load on Building 28 Distribution system.

3.9.9.4.4 *Recommendations:*

The Generator Relocation project that is under construction will consolidate the generators in a central location and with the use of paralleling switchgear PSG, the emergency power capability on campus will be greatly increased. This action will provide the emergency power necessary for a future chiller should the need arise.

3.9.9.5 *Emergency Backup Power System*

The entire campus is fully backed up with emergency generators and all are diesel engine generator sets. There are five fixed generators currently installed for East and West Distribution systems. Building 28 has two generator sets installed. For temporary power purposes, RML has a portable 750 KW generator set.

A generator replacement project had replaced the generators previously designated as G1 and G2 with a single generator capacity of 1250 KW and designated as G1. Generator G1 would typically be rated for 80% of its capacity, or 1000 KW. Recent readings taken for the MUP indicate a demand load of 400 KW on this generator. Under the same project a second generator rated at 1250 KW and designated as G2 has been installed to support the campus cooling system. Generator G2 would typically be rated for 80% of its capacity, or 1000 KW. Recent readings taken for the MUP indicate a demand load of 900 KW on this generator. Both G1 and G2 are located on the exterior of Building 7.

Generator G3 is a 1250 KW, 277/480 volt, 3-phase, diesel engine generator set that serves switchboard MSBA1, which is located in Building A. It has a separate 4,000-gallon fuel tank.

Generator G4 is a 1500 KW, 277/480-volt, 3-phase diesel engine generator set installed in 2002 to provide backup Power to the West Distribution system. With the exception of Building 26 (Steam Plant), G4 provides backup power to all buildings tied to the West Distribution system. The set has an 8,000-gallon fuel tank providing over 80 hours of backup fuel, however, the tank was sized for the addition of a second 1500 KW generator which would decrease the fuel capacity to 40 hours each.

Generator G5 is a 300 KW, 277/480-volt, 3-phase diesel fired engine generator set located in the new steam plant built in 2001 and serves only that facility. The G5 has a sub base mounted 200-gallon fuel tank to provide a minimum of 40 hours of backup capability.

As part of the Building 28 (Integrated Research Facility), a generator set (G6) and generator set (G7) are provided. Generator G6, located in Building 25, has a capacity of 2000 KW, but would typically be rated for 80% of this load, or 1600 KW. Recent readings taken for the MUP indicate a demand load of 1600 KW on this generator. Generator G7, located in Building 27, has a capacity of 600 KW, but would typically be rated for 80% of this load, or 400 KW. Recent readings taken for the MUP indicate a demand load of 400 KW on this generator. The demand loads for both G6 and G7 are estimates, as at the time of the readings Building 28 was not fully operational. G6 serves the main building complex while the G7 provides a separate backup power source for the cooling systems within the building. G6 has a 10,000 gallon fuel storage tank for 72 hours backup capacity with a 300 gallon sub-base tank which acts as a day tank. G7 is a fully enclosed, exterior unit with a 3000 gallon sub-base tank for 72 hours also. G7 is provided with a radiator mounted resistive load bank rated at 75% load. G6 is provided with an exterior air cooled resistive load bank rated at 75% load, located between Buildings 25 and 28.

While the Generator Relocation project is underway, the above statements about generators G1 thru G7 will continue to be true to varying degrees. When the Expansion project is completed in year 2015, generators G1 thru G4 will be relocated and connected to new paralleling switchgear PSG and distributed through new switchgear DSG for use around the RML campus. This is illustrated in ADGPC drawings E3.2 and ES1.0. Switchgear PSG will also include the purchase of G8 rated 1500 kW. Generators G5 and G6 will remain at their present locations. Generator G7 shall be salvaged at the completion of the Expansion project.

Having the generators in a central location will improve reliability and increase capacity. Future campus expansion will be greatly improved under this configuration with a total connected capacity at 6.75 MW.

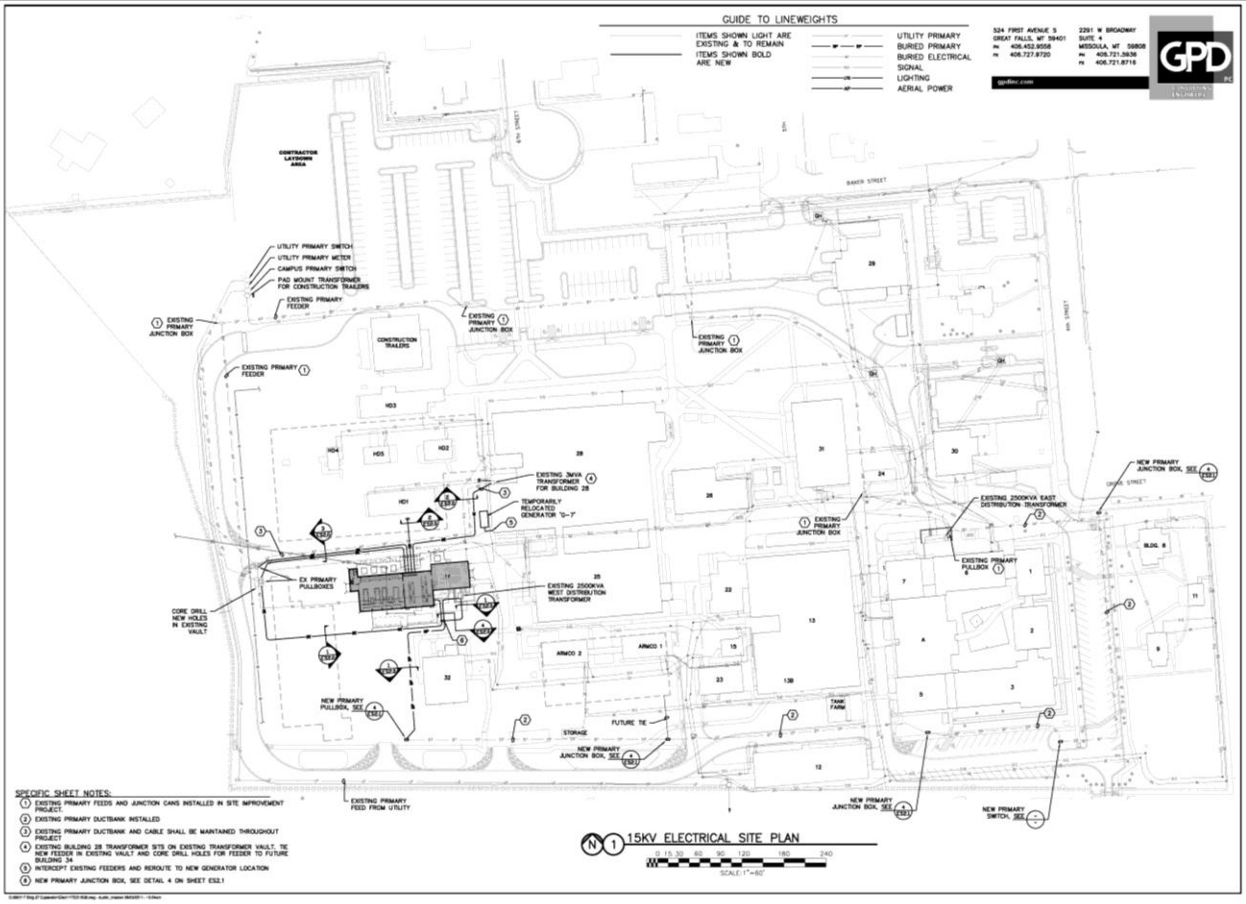

Exhibit 3-36: Building 27 Expansion Electrical Site Plan

3.9.9.6 *Underground Power Distribution System*

Refer to Exhibit 3-37. A system of power manholes and an underground duct bank system have been installed with conduits running from both the East and West Distribution systems and connecting to each building on campus. Spare conduits have been installed in each bank of conduits to allow addition of future facilities. The system was installed with the conduits approximately 6 feet below grade and bedded in sand. Spare conduits were installed in all duct banks with the main concentration out of Building 27. The manholes are large enough that additional conduits can be added to the existing system without significant difficulty or conflicts with existing conduits. The number of spare conduits starting out from the West Distribution System should be adequate for the capacity of the building. At each manhole the spare conduits divide to cover more area. This results in fewer spare conduits as the distance from Building 27 increases. The potential need for additional conduits for new projects therefore also increases as the distance from Building 27 increases. The requirements for new conduits will have to be evaluated on a case by case basis as new projects are developed.

The underground power distribution system is presently being modified by the Generator Relocation project.

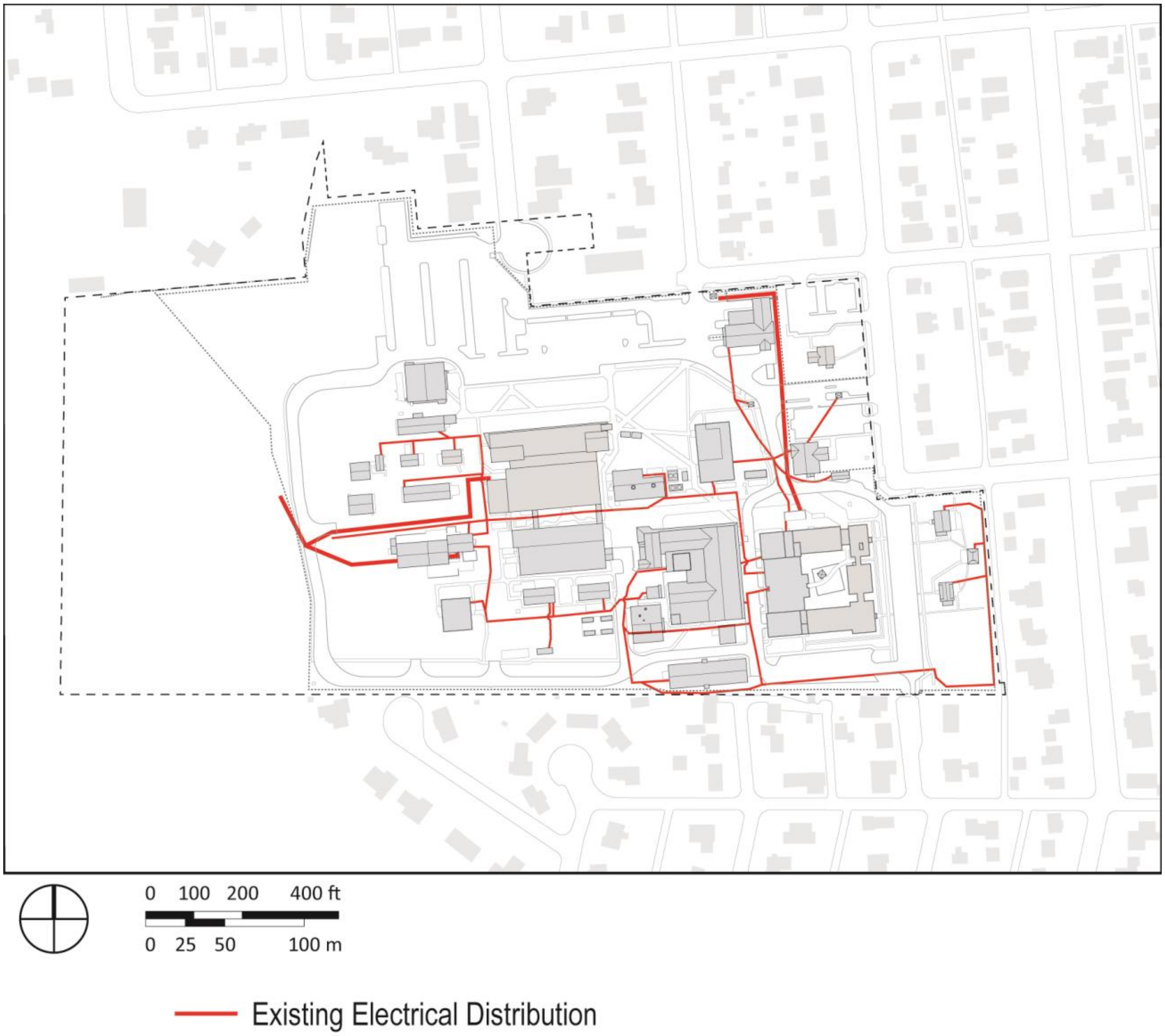

Exhibit 3-37: Existing Site Power Raceway Plan

3.9.10 Telephone System

As describe in section 2.3.5, general telephone service is provided to the RML campus by CenturyLink via a 100-pair line and a T1 circuit. Services include 'plain old telephone service' (POTS) lines, central office trunks, and Direct Inward Dial (DID). Limited services from the local CenturyLink office due to their outdated infrastructure may impact future telecommunications services at RML.

The RML campus telephone and network system is fed from one Main Distribution Frame located on the first floor of Building 6, which is the primary demarcation point and location of the principal telephone PBX system. Secondary/redundant telephone hardware is located in Bldg. 28; this location also provides phone service to several buildings on the west side of campus.

NIAID is in the process of transitioning to a Microsoft Lync infrastructure for enterprise unified communications. Plans are being developed to integrate the RML campus into the Lync enterprise system, tentatively within two years.

3.9.11 Network Systems

As describe in section 2.3.5, the general user/data network at RML is provided and managed by NIAID. Primary wide area network connectivity to NIAID/Maryland, NIH and the internet is through a 10 GIG-E circuit currently hosted by Zayo and Level 3 Communications. In case of an outage on the primary 10 GIG-E circuit a secondary/failover DS3 circuit hosted by Verizon Business provides connectivity.

The primary fiber hub for the NIAID user/data network is located in Bldg. 6 first floor, at the location of the main telephone system and demarcation point. A secondary fiber hub for several buildings on the west side of campus is located in the Bldg. 28 server room.

Research has been ongoing to evaluate options for a second 10 GIG-E circuit to replace the failover DS3 line. Fiber services for the Bitterroot Valley are delivered from Missoula, Montana; currently there are no alternatives for fiber connectivity going directly south or east out of the Bitterroot Valley. This constraint remains a concern for efficient and reliable failover connectivity, disaster recovery and continuity of operations planning.

NIH/ORS-ORF has a 48-strand fiber loop throughout numerous buildings on the RML campus which is used for various ORS/ORF-managed systems, such as Andover, Airship, Fiber Patrol, Building Automation Systems, fire alarm, and paging. The ORS/ORF fiber infrastructure is separate from the NIAID fiber backbone that is used for the general user/data network.

NIH/CIT provides a T1 circuit for connectivity to the Andover security access control system for the RML campus. Increasing implementation of networked security systems on the RML campus may initiate a requirements analysis for expanding the bandwidth of the NIH/CIT-provided circuit to support the NIH/ORS security systems.

3.9.12 Technology

3.9.12.1 *Consolidation of Computational Research Project*

Expanding scientific computational requirements and data output have resulted in the two existing server rooms on the RML campus to reach capacity. To meet the scientific research mission of the NIAID and NIH and complete NIAID's three phase network consolidation plan, NIAID and NIH/ORF are in the planning stages of constructing a consolidated computational research center at RML. The proposed computational facility will provide the necessary capacity, infrastructure, flexibilities and redundancies to address the increasing technology requirements of the NIAID research community through the next ten years. The projected location of the computational facility is the first floor of Bldg. 31. Additional construction efforts are being included in the plan to provide capabilities for future expansion of the facility.

3.9.12.2 *Biomedical Technology Services*

Specific scientific groups at RML provide core services to all of NIAID, including high throughput/Next Generation sequencing, electron microscopy imaging and visual medical arts. Facilitating high-speed large data set transfers between RML and Bethesda, Maryland customers is currently accomplished through the use of Aspera software solutions. It is anticipated that RML will continue to provide these core services and expand data exchange between campuses.

RML utilizes multiple NIAID enterprise functions and also locally provides services such as research and bioinformatics support, desktop support, high performance computing infrastructure, and application hosting and development.

3.9.12.3 *Conference and Collaboration Requirements*

Given RML's world-wide scientific collaborations and geographic location, remote conferencing capabilities are critical for meeting the scientific mission of the NIAID and NIH. RML staff rely heavily on services such video teleconference, Microsoft Lync, and GoToMeeting to maintain effective communications with remote coworkers and collaborators around the world. To this end, maintaining a sufficient number of conference rooms and collaboration areas at RML is a critical factor in meeting the remote conferencing requirements. Technologies such as telepresence are being planned for integration into select RML conference rooms to support effective and efficient virtual meetings.

3.9.13 Fire Alarm System

The electrical components of the Campus Fire Alarm system consists of a main panel located in Building A and a main panel in Building 28 with remote panels in individual buildings with communication back to the main panels. The system is monitored remotely at the guard's station in the Visitor's Center (Building 30). Signal Systems Underground Raceway Distribution System: A system of signal manholes and an underground duct bank system have been installed with conduits running between each manhole and connecting to each building on campus. Spare conduits have been installed in each bank of conduits to allow addition of future facilities. The system was installed with the conduits approximately 6' feet below grade and bedded in sand. The manholes are large enough that additional conduits can be added to the existing system without significant difficulty or conflicts with existing conduits. The spare capacity is adequate for most future additions at the campus. In general there are three 4" signal conduits to each building and four 4" signal conduits between each manhole.

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4 THE MASTER PLAN UPDATE FOR THE RML CAMPUS

The RML Master Plan Update 2015 is designed to achieve the same goals as the 2009 Master Plan, namely to address the potential long-term land use planning and facility issues of concern to both RML and the local community, while improving the appearance and functionality of the campus.

4.1 PLANNING PROCESS AND PROGRAM SUMMARY

4.1.1 Master Plan Process

Development of the RML Master Plan update followed a logical process. The Division of Facilities Planning developed a draft master plan based on current conditions, discussion with ORF RML staff, review of ORF and NIAID generated planning documents and review of Building and Facilities Meeting minutes. The Building and Facilities Meetings are conducted every fall with National Institute of Allergy and Infectious Disease (NIAID) leadership. The draft Master Plan Update was distributed for comment to ORF, ORS and NIAID staff. All direction and decisions have been coordinated with NIAID and ORF staff. Final decision making on all facilities related issues are the responsibility of the Facility Working Group (FWG) and, ultimately, with the Department of Health and Human Services.

The surrounding community is an important part of any NIH Master Plan. NIH shall continue to inform the local community, neighbors of the lab, and public agencies about development and changes to the Master Plan as they evolve. As research initiatives move forward, personnel and facility requirements may change further. For that reason the Master Plan is updated periodically. It recognizes, however, that actual program realization will depend on NIH and Department of Health and Human Services (HHS) priorities, congressional and presidential policy decisions, and federal budgetary realities and availability of resources.

Furthermore, while the Master Plan is a reasonable guideline for future development it does not represent the pre-approval of any individual facilities project nor the particular needs of specific programs to be accommodated on the campus since the financing of such projects and programs must be addressed within the annual HHS budget processes and the HHS Capital Investment Review Board mechanisms. This plan is not a capital development plan.

The following activities were part of the master planning process:

4.1.1.1 Establishing Planning Goals, Objectives, and Premises

This process, conducted in the 2009 Master Plan, established the basic objectives which need to be achieved by the Master Plan in support of the research mission of the RML, The process also defined the fundamental attitudes which supported and shaped the direction of subsequent studies. These goals have been revalidated by the RML Master Plan Update 2015.

4.1.1.2 Data Gathering and Analysis

In 2009 the Data Gathering and Analysis Phase involved documenting physical site conditions and interviewing RML personnel to update the programmatic needs for the campus. For the 2015 RML Master Plan Update, however, the Division of Facilities Planning was able to rely on a GSA/NIAID generated report for much of the documentation of the physical site conditions and interviews with RML NIAID personnel.

In January 2014, NIAID released the draft Rocky Mounty Laboratory Physical Security and Space Needs Assessment. The design team of Dewberry, Hinman and Perkins+Will was commissioned to complete a space assessment and security assessment of the campus. The space assessment focused on NIAID's space with an evaluation of existing facilities, the efficiency and appropriateness of use, general conditions of existing space and security needs. Rather than conducting interviews that were redundant to those conducted by the Dewberry team in 2013, the Division of Facilities Planning used this report and the meeting minutes documented in the report's Appendices, as the RML Personnel interviews and physical site condition assessment. During the analysis phase the data was compiled, augmented, and later adjusted to project campus population and space needs, in increments, over the next 20 years. The physical site data was analyzed to confirm general patterns of land use, building disposition, landscaping and other important features within the campus, and to understand the RML site in relationship to its surrounding context.

4.1.1.3 Development of Program and Planning Principles

During this phase, the campus space needs were further defined to determine appropriate allocations of space to various campus uses and identify other needs or activities which should be addressed by the Master Plan. Concurrently, general Planning Principles, derived from the analysis of existing conditions and Planning Premises were reviewed and updated. The Programming and Planning Principles have been revalidated in the Master Plan update.

4.1.1.4 Alternative Concept Studies

In the original 2009 Master plan three concept studies showing alternative campus development strategies and potential building sizes and locations were prepared and reviewed for appropriateness. The Master Plan Steering Committee adjusted programmatic and planning objectives both to reflect the consensus reached among RML and NIAID leadership regarding estimated program and personnel growth and, in anticipation of community concerns regarding such issues as: traffic through the residential neighborhood and construction density on the site relative to the surrounding community. Further, direction was established with respect to the location and relationships of functional components.

The Data Gathering and Analysis and the Development of Program and Planning for the Master Plan Update informed the ORF Division of Facilities Planning that any needed revisions in the Master Plan Update would be minor. Therefore the most logical solution was proposed and no alternatives were developed.

4.1.2 Summary of Master Plan Goals

In order to accomplish the RML mission in an efficient and effective manner, it is imperative that RML have an agreed upon long range facilities plan that:

- addresses facility and campus requirements,
- encourages prudent land use, and
- guides orderly future development.

The objective of the Master Plan is to provide a guide for the reasoned and orderly potential development of the campus that builds on existing resources, corrects existing deficiencies and meets changing needs through both new construction and renovation while setting forth implementation priorities and a logical sequencing of potential planned development.

The plan is based on phased personnel and space estimates. The document is not intended to be a specific design and construction program, but rather a framework within which the design and construction of required facilities could occur over the next 20 years as the potential programmatic plans arise and funding becomes available.

The NIH, with the NIAID and RML, seeks to accomplish its mission by:

- Fostering fundamental discoveries and innovative research, and their applications, in order to advance the Nation's capacity to protect and improve health;

- Developing, maintaining, and renewing the human and physical resources that are vital to ensure the Nation's capability to prevent disease, improve health, and enhance quality of life;
- Expanding the knowledge base in biomedical and associated sciences in order to enhance America's economic well-being and ensure a continued high return on the public investment in research; and
- Exemplifying and promoting the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science.

The Master Plan supports this mission with the following planning goals:

- **Goal 1**: Provide a flexible framework for a "living campus", one that can adapt to the needs of current and future NIAID and National Institute of Health programs in support of the scientific mission of the National Institutes of Health.
- **Goal 2**: Provide an attractive campus whose setting and composition promote collegial interaction and opportunities for informal and formal collaboration and exchange of ideas, expertise and data.
- **Goal 3**: Provide a secure, supportive, and convenient work environment for the people involved in RML activities, including scientists and professional administrative staff, visitors and other non-RML users, with amenities that enhance the quality of life for staff.
- **Goal 4**: Enhance the appearance of the RML campus so that it complements the surrounding residential community.
- **Goal 5**: Protect, conserve and enhance RML's natural, historic, and scenic resources.
- **Goal 6**: Foster improved communication about, and better understanding of, NIH goals and policies through the planning process.
- **Goal 7:** Meet the Federal Real Property Council's Performance Measures.

4.1.3 Program Needs:

Per section 1.9.2, the following program needs were identified:

- Bio-Safety Lab level-(BSL) 2 and BSL- 3 laboratories;
- Specialized animal research space;
- Computational Research Center;
- Administrative Space;
- Conference and Collaboration Space;
- Archival storage;
- Increased utility capacity;
- Replace functionally unsuitable buildings;
- Service and Support Facility;
- Waste Marshalling facility;
- Vehicle storage.

4.1.4 Summary of Planning and Programming Premises

4.1.4.1 Growth

Under the proposed 2015 Master Plan Update, NIH would continue to develop RML to accommodate NIH's and NIAID's research consistent with the commitment to maintain the "campus" character of the site. This Master Plan Update advances this objective by programming and locating potential future RML growth so that local services and utilities would be available to support campus growth, and establishing development guidelines for possible future changes to the site that ensure that, as the campus grows, new development would be responsive to the context of adjacent neighborhoods.

The following sections of the plan contain personnel estimates provided by RML and NIAID, staff, during interviews conducted by the planning team in 2006 and as updated in 2014 based on the draft Rocky Mounty Laboratory Physical Security and Space Needs Assessment and the 2014 NIH Personnel Census. In 2009, as part of the programming phase of the Master Plan, space estimates were prepared by the planning team based upon personnel estimates. For the RML Master Plan Update in 2015, these space estimates were revalidated and augmented by newly identifies needs.

It is important to note, that the distribution of personnel and space by phase in Exhibit 4-1 and Exhibit 4-2 are provided to illustrate the results of the programmatic discussions and are not meant to suggest that campus growth in terms of personnel or space could only occur as shown. Thus the 2015 Master Plan Update serves as a framework for future growth but, as priorities change and resources become available, phasing of projects may need to adjust to meet those priorities.

4.1.4.2 Personnel Growth Estimates

If the campus develops as planned, the RML population could, potentially, grow 43 percent from its current population of 372 Employees, Contractors and Fellows (July 2014 NIH census) to a total campus population of 511 by the end of the planning period. The primary growth at the campus would be in Intramural Research personnel and NIH support staff. NIAID programs continue to expand on the RML campus in the areas of genomics, proteomics, imaging and high throughput sequencing with additional need for dry lab and administrative office spaces.

4.1.4.3 Facilities Growth

This 2015 Master Plan Update uses the 2009 Master Plan and estimated IC growth estimates to determine potential gross area requirements.

4.1.4.4 Programmed Built Area

Total building area could increase from 363,266 existing gross square feet (gsf) to an estimated 506,126 gsf, in order to address potential new research needs and to correct existing deficiencies. Over this period an estimated 26,290 gsf of existing space could be demolished and an estimated 532,416 gsf of new space could be constructed. The largest programmed growth component would occur within the second phase of the plan (depending upon NIAID program priorities and availability of resources) due to the construction of a new laboratory. The following tables set forth gross area and population plans by major functional unit.

Exhibit 4-1: Potential GSF Area Requirements by Functional Unit

	Exist. (2014)	Phase 1		Phase 2		Phase 3		Phase 4		All Phases
Function	**Built**	**Proposed Construction**	**Proposed Demolition**	**Proposed Construction**	**Proposed Demolition**	**Proposed Construction**	**Proposed Demolition**	**Proposed Construction**	**Proposed Demolition**	**GSF**
Admin. Services	37,972					10,000			-7,690	40,282
Central Plant	10,681			1,000						11,681
Interpretive Center	0							3,400		3,400
Laboratory, Director's Reserve and Shared Laboratory Support	218,816			70,000		13,140				301,956
Maint. Shops and Storage	22,450	30,190	-13,064							39,576
Shipping and Receiving	10,149			5,665						15,814
Vacant	1,867									1,867
Veterinary Branch	57,769	1,440						34,315	-5,536	87,988
Visitor's Center	3,562									3,562
Total	**363,266**	**31,630**	**-13,064**	**76,665**	**0**	**23,140**	**0**	**37,715**	**-13,226**	**506,126**

Exhibit 4-2: Potential Population Growth (FTE, Contractors, Fellows) by Functional Unit

	Exist. (2014)	Phase 1	Phase 2	Phase 3	Phase 4	All Phases
Admin. Services	53	0		5	0	58
Central Plant	6		0			6
Interpretive Center	0				4	4
Laboratory, Director's Reserve and Shared Laboratory Support	242	10	92	17		361
Maintenance Shops and Storage	24	0				24
Shipping and Receiving	8		1			9
Veterinary Branch	25	0			10	35
Visitor's Center	14					14
Total	**372**	**10**	**93**	**22**	**14**	**511**

In order to accommodate these expectations, the RML has planned for a combination of renovations of existing structures and construction of new facilities. The listed increases in area, however, represent only new construction to expand capacity, to replace obsolete facilities, or permit a decompression or reassignment of space through renovation of existing buildings. The table does not identify the areas of renovation that would be needed in buildings, such as the Quad (Buildings 1, 2, 3, 5, 6, 7 and A), 8 and 9, to correct existing deficiencies. For example, although 75,450 GSF of research laboratory space could be added to the campus over the next 20 years, significant renovation would be carried out in existing laboratory areas of the original Quad (Bldgs. 1-7) as well.

4.1.4.5 Planning Premises

4.1.4.5.1 Building and Land Use

- Similar building uses should be grouped together geographically.
- Employee amenities and services should be increased and consolidated.

4.1.4.5.2 Open Space

- A perceivable and hierarchical system of open spaces should be developed to create areas for formal and informal interaction.
- The buffer zone at the site perimeter should be enhanced and respected where possible.
- Landscaping elements should be improved and increased.

4.1.4.5.3 Architectural Guidelines

- HHS and NIH Policies should be used as guidelines for future development.
- Development should respect historic patterns, and should convey a sense of order, quality, and unity throughout the campus.
- Building interiors should be designed with maximum flexibility to facilitate change as needs dictate.

4.1.4.5.4 Transportation/Circulation

- A well-defined road system should be established to increase efficiency, orient visitors, and protect open space.
- New parking should be located outside the loop road separated from the pedestrian core of the campus.
- Parking should be on-grade rather than in parking structures consistent with the scale and character of the adjacent residential community.
- A campus character that encourages pedestrian use should be promoted.
- Accessibility for persons with disabilities must be ensured.

4.1.4.5.5 Infrastructure

- Major utility infrastructure and service uses should be geographically concentrated.
- The development of Utilities should be coordinated with the Master Utility Plan.

4.1.4.5.6 Laboratory Research Programs

- Planning should group research laboratories in close proximity to the central animal facilities.
- Functionally related laboratories should be grouped together.
- The historic Quad (Buildings 1, 2, 3, 5, 6, 7 and A) should be retained for research laboratory use but renovated to increase space efficiencies.

4.1.4.5.7 Animal Programs

- Planning for animal programs should provide for current needs while anticipating future requirements.

4.1.4.5.8 Management

- A "good neighbor" relationship should be maintained with the surrounding community.
- RML should continue to provide means for citizen involvement in activities on campus.

4.1.4.5.9 Amenities and Site Program

- The Master Plan should provide for amenities in accordance with the approved Guidelines for Amenities and Services within NIH Facilities, December 2004. Where possible, amenities should be consolidated together for ease of access and management.
- Amenities not specifically programmed, but that may be absorbed within the gross area allocated to space programs of major buildings should be distributed according to the Amenities Guidelines.
- Outdoor spaces planned for recreation, including bicycle and hiking paths, should be provided.

4.1.5 Planning Principles

Planning principles were established as the first step toward conceptual designs, and represent broad physical design objectives which guided the concept plans prepared for the site. The major Planning Principles have been grouped into four categories, which are described below.

4.1.5.1 Campus Structure and Landscaping (Exhibit 4-3)

- Respect the existing campus orthogonal grid in developing a new campus structure.
- Retain the historic core as a major campus organizational feature.
- Create a better-defined sense of hierarchy among campus buildings and open spaces.
- Create or enhance defined open spaces within the interior of the campus.
- Locate and utilize interior campus open spaces to link buildings and create a pedestrian friendly environment.
- Preserve the perimeter of the campus as open space with an informal landscaped screen buffer.
- Preserve and enhance the relationship of the campus to its broader environment.

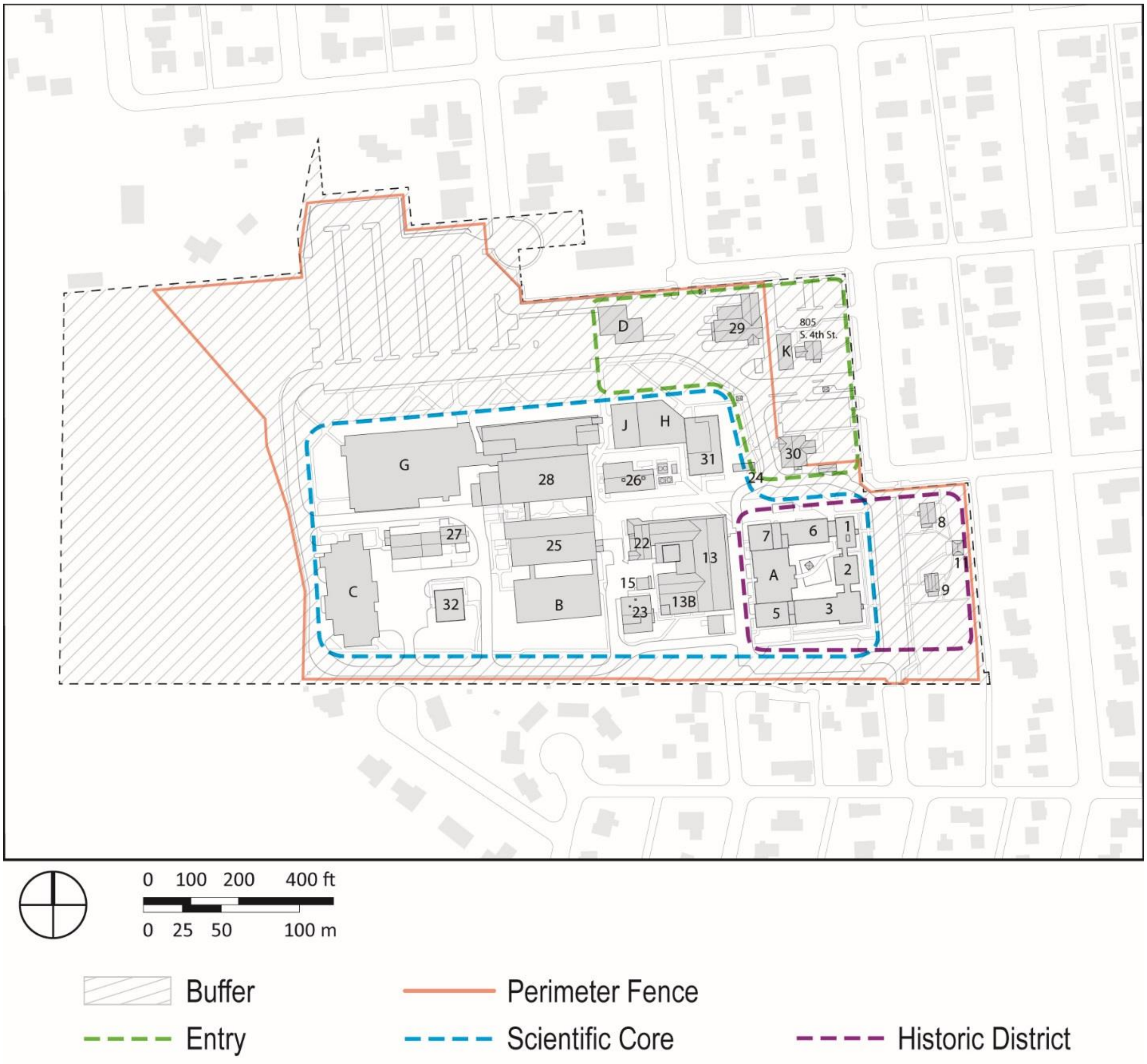

Exhibit 4-3: Campus Structure

4.1.5.2 Development Height Zones (Exhibit 4-4)

- Establish maximum building height (70’) at the campus core surrounded by buildings of medium height (40’) and with lowest construction density (0’-20’, except for the two, existing, 2 and 1/2 story houses in the historic core) at the campus perimeter.

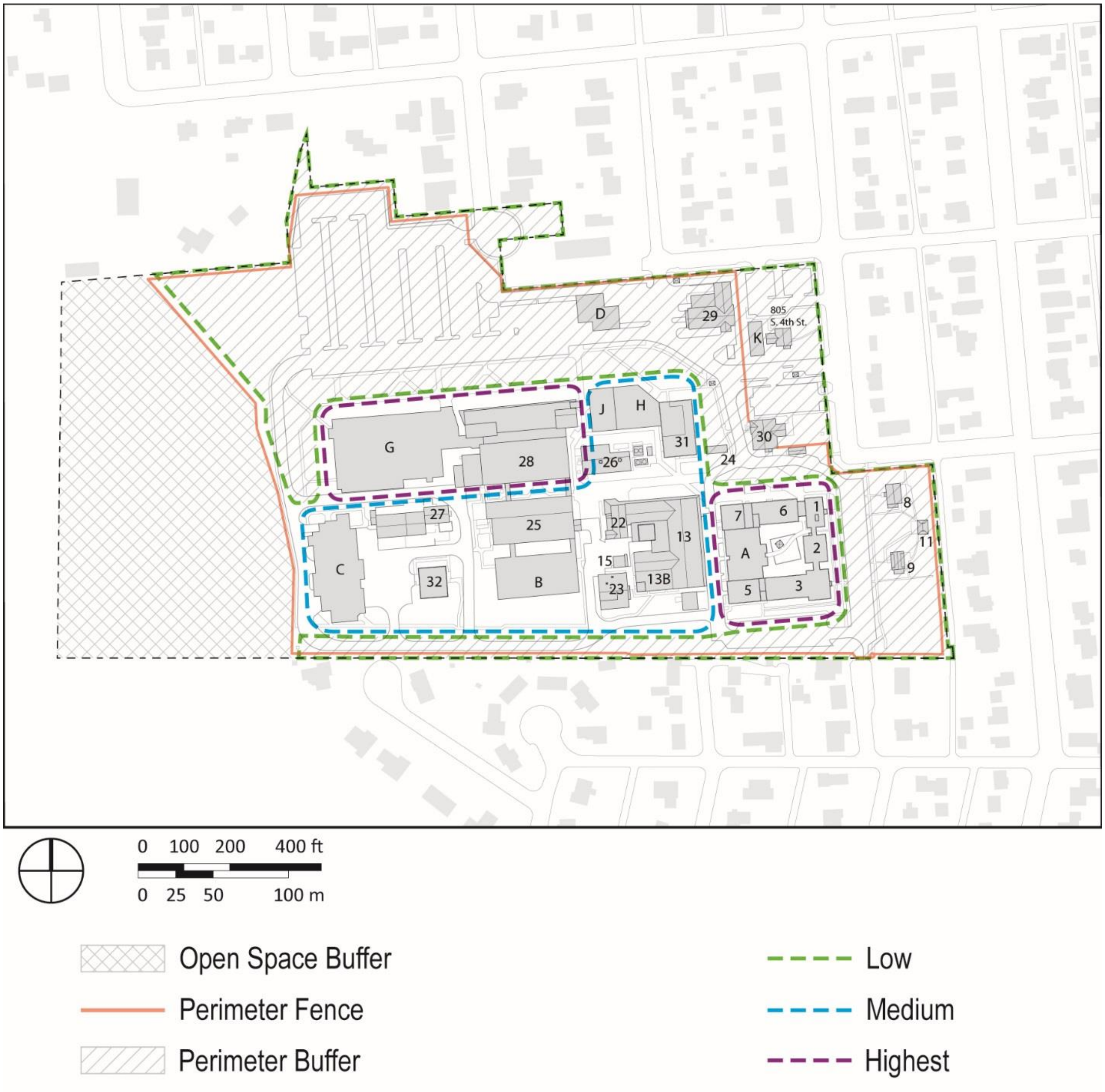

Exhibit 4-4: Development Height Zones

4.1.5.3 Access and Parking (Exhibit 4-5)

- Maintain and enhance the current 4th Street main entrance and the 5th and Baker Streets service entrance.
- Reinforce campus organization and facilitate controlled vehicular access to all areas of the campus through the creation of a loop road.
- Provide all parking in surface lots.
- Locate new parking along the north perimeter of the campus.
- Retain and improve parking to the east and south of the Quad both to achieve required surface parking spaces and for staff convenience.
- Create a walking path within the occupied portion of the site, and extend a hiking trail through the west side of the site.
- Provide additional pedestrian/bicycle access gates in the perimeter fence to encourage employees to use alternative modes of travel and to allow access to the natural area on the western portion of the site.

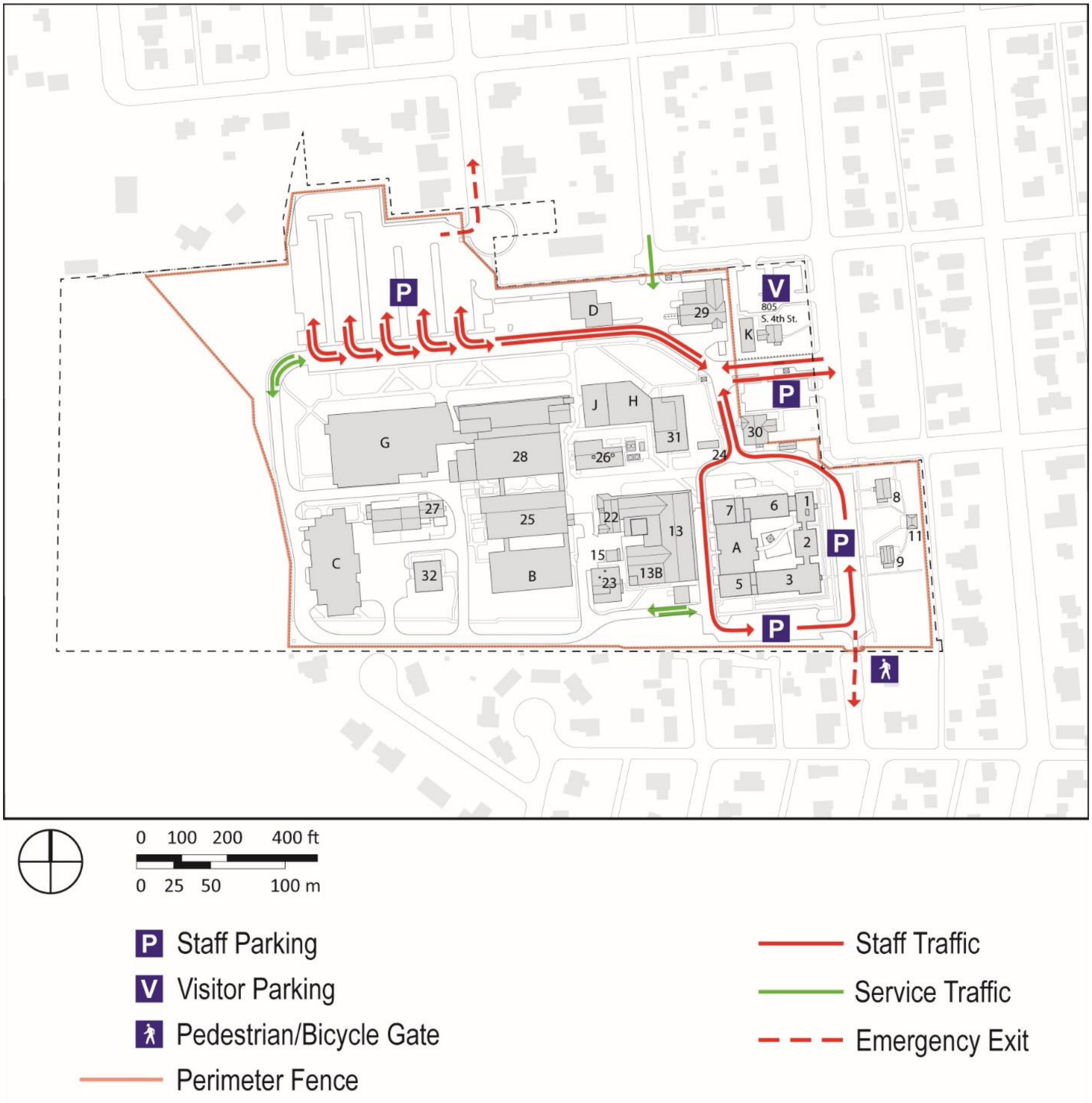

Exhibit 4-5: Access and Parking

4.1.5.4 Functional Relationships (Exhibit 4-6)

- Relate existing and planned building groupings to an overall campus' orthogonal structure.
- Reinforce the laboratory and animal buildings as the functional heart of the campus.
- Consolidate administrative and support functions.

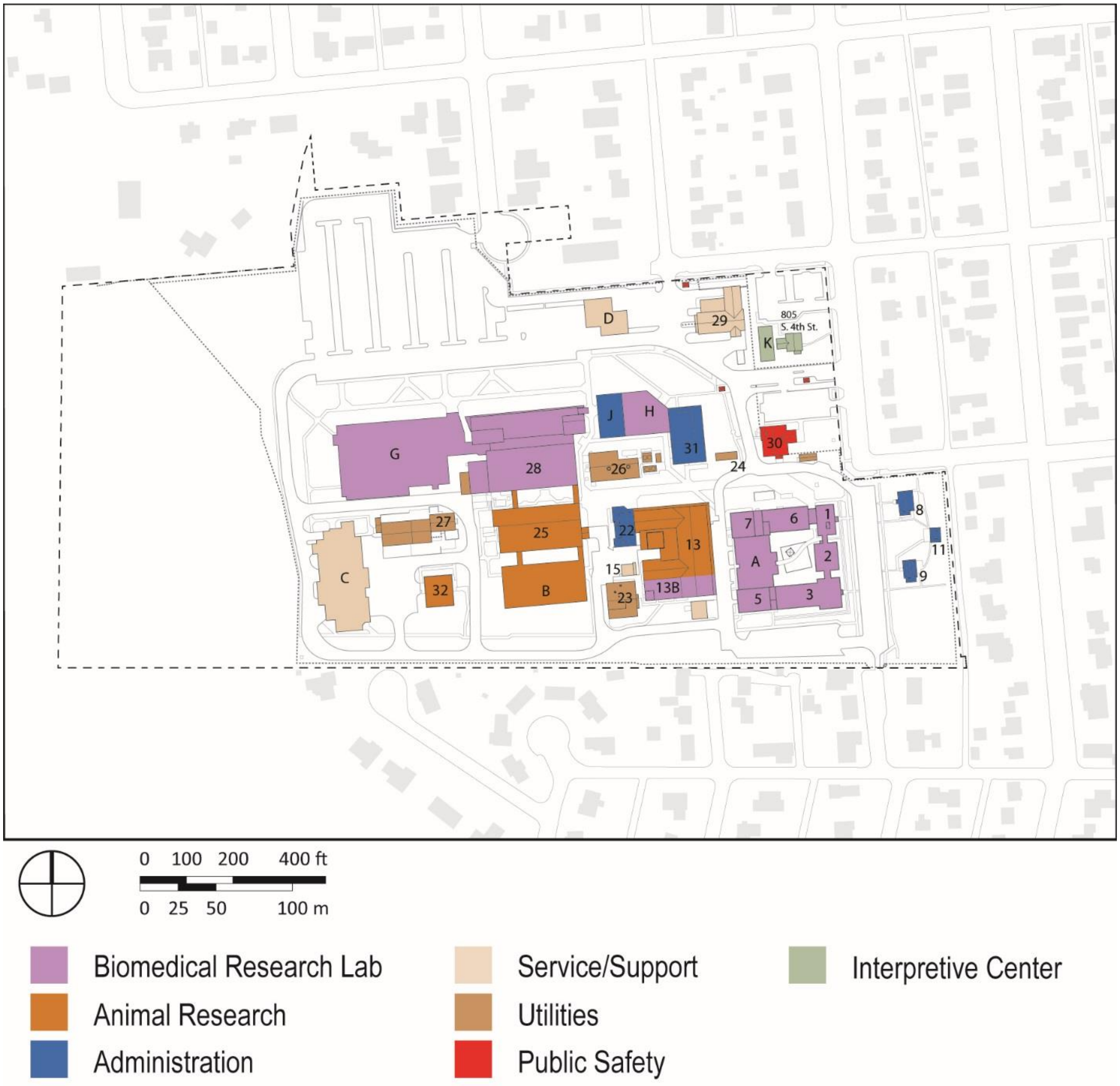

Exhibit 4-6: Projected Building Use

4.2 MASTER DEVELOPMENT PLAN UPDATE

4.2.1 Current Status of Projects

The 2014 census totaled 372 employees, fellows and contractors at RML. ORF records indicate a total building space inventory of approximately 363,266 gsf spread across 40 buildings and temporary structures. Phase 1 of the 2009 Master Plan is nearly complete and several of the projects in phase 2 are complete or in the planning phase as shown in Exhibit E.

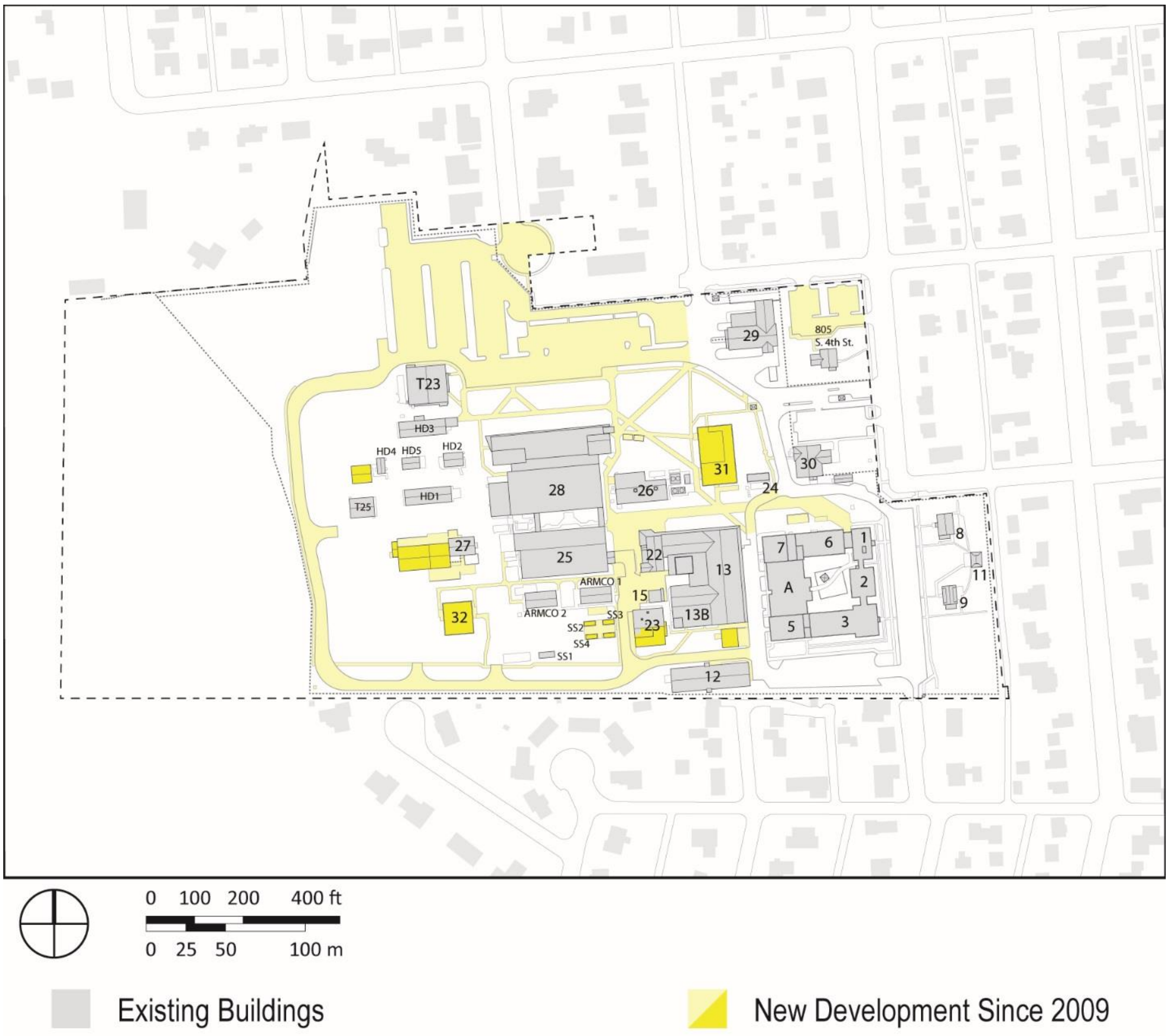

Exhibit 4-7: New Development Since 2009

Exhibit 4-8: Current Status of 2009 Master Plan Projects

2009 Master Plan	Action	Use	Demolished (GSF)	Constructed (GSF)
Phase 1	Construct Building 31	Administrative		29,695
Phase 1	Construct Building 32	Animal Facility		4,020
Phase 1	Demolish Building 14	Storage	4,000	
Phase 1	Demolish Building 16	Research Support	3,520	
Phase 1	Demolish Building 17	Storage	2,975	
Phase 1	Demolish Building 21	Equipment Storage	2,843	
Phase 1	Site Improvements	Purchase North and Northeast property		
Phase 1	Site Improvements	Construct Loop Road		
Phase 1	Site Improvements	Parking		
Phase 1	Site Improvements	Security Fence around the new north property		
Phase 1	Site Improvements	Demolish duplex house on new northeast property		
Phase 1	Site Improvements	Construct Parking on northeast property		
Phase 2	Construct Building F	Central Generator Plant Addition		5,657
		Total GSF Change	13,338	39,372

Currently, the projects in construction, design and planning are:

- Construction: Generator Expansion and Centralization project (Building F), as shown in the 2009 Master Plan, is under construction.
- Design: Modification to the new Building 31 to house a new Computational Research Center to be funded by NIAID. Demand for on-site data processing and storage has grown exponentially in the last several years. This project will address the current demand. The design is proceeding. In order to accommodate the CCR, functions located in Building 31 will be relocated to Buildings 8, 9, and 12.
- Planning: The Program of Requirements (POR) and schematic design for a new Maintenance Facility (Buildings C) has been completed. This project is not currently funded.

- Planning: The POR for a new Laboratory (Building G) and schematic design has been completed. This project is not currently funded.
- Study: The Rocky Mounty Laboratory Physical Security and Space Needs Assessment proposed that Buildings 8, 9, and 12 can be renovated to comply with security requirements. NIAID would like to use these buildings for administrative functions. The Office of Research Facilities is working with the Division of Physical Security and the State Historic Preservation Office to proposed renovations to Building 8 and 9 that will allow administrative functions to be housed in the buildings. These projects are in development but not currently funded.

4.2.2 Introduction to the Master Plan Update

The RML Master Plan Update is a strategic tool for the efficient allocation of campus resources, the orderly accommodation of future growth and the creation of an environment which is both functionally and aesthetically conducive to accomplishing the RML mission. The facilities plan accommodates the program plans set forth in Section 1.9.4, and the Goals and Objectives elaborated on in Section 4.1.2. The 2009 Master Plan and this 2015 Master Plan update provide a rational framework to accommodate projected growth incrementally, and in a manner which consistently reinforces a desired character for the campus.

The Master Plan established the historic Quad (Buildings 1, 2, 3, 5, 6, 7 and A) and the IRF(Building 28) as the armature, with buildings and open spaces built around them, and all parts of the campus linked in an orthogonal grid. The core of the campus has a denser character; while buildings near the perimeter are set at more generous spacing within the landscape.

Based on the guidance of the 2009 Master Plan, the pedestrian core of the campus is now enclosed within a loop road that features campus entries for visitors and staff on the east side at the current 4th Street entrance and for service traffic at the northeast corner near 5th and Baker Streets.

A standoff and buffer setback area, 100’ deep, will be maintained around the site perimeter interrupted only along the southeast boundary by existing surface parking; at the east side by existing historic Buildings 1, 6, 8, 9, 11 and 805 South 4TH Street; and to the north by the proposed Shipping and Receiving Building (Building D) and new surface parking lot for staff.

A combination of renovation of existing structures and construction of new facilities will continue to accommodate functional needs. The 2015 Master Plan Update area square footage increases listed in Section 4.1.4 represent projected new construction needed only to expand capacity, to replace obsolete facilities or permit a decompression or reassignment of space because of renovation of existing buildings. They do not identify the specific areas of renovation that would be carried out in existing buildings. **Exhibit 4-9** lists existing buildings and notes the disposition of each over the course of the 20-year 2015 Master Plan Update, including renovation to correct existing deficiencies.

Exhibit 4-9: Existing Buildings and Potential Disposition in Master Plan Update

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
RML 01	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	8246	Renovate the Quad to increase Utilization Rate and modernize meeting and conferencing spaces and house the Visual Medical Arts Branch
RML A	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	24929	
RML 02	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	9468	
RML 03	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	24814	
RML 05	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	7224	
RML 06	The Quad Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	15000	
RML 07	The Quad Laboratory vacant	Laboratory, Director's Reserve and Shared Laboratory Support	3975	
RML 08	Limited Use due to security concerns	Vacant	4461	Renovate Building 8 to address security concerns. To be used for Administrative space.
RML 09	Limited Use due to security concerns	Vacant	3156	Renovate Building 9 to address security concerns. To be used for Administrative space.
RML 11	Contract Support Services due to	Administrative Services	660	Retain

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
	security concerns			
RML 12	Freezer Storage, Medical Arts, Fitness	Laboratory, Director's Reserve and Shared Laboratory Support	7690	Relocate Visual Medical Arts into Building 1.Relocate remaining functions to proposed buildings D and J. Raze Building 12.
RML 13	Animal	Veterinary Branch	17800	Retain
RML 13B	Laboratory	Laboratory, Director's Reserve and Shared Laboratory Support	5880	Retain
RML 15	Radiological Storage	Equipment Storage	1092	Retain
RML 22	Waste Marshalling/ Recycling Facility	Shipping and Receiving	2624	Relocate shipping and Receiving function to Building D and Renovate Building 22 for facility support functions.
RML 23	Incinerator with scrubber	Central plant	2356	Retain
RML 24	East Emergency Generator	Central plant	700	Retain
RML 25	Animal	Animal, Laboratory, and Director's Reserve	33901	Retain

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
RML 26	Central Boiler Plant	Central plant	5664	Retain
RML 27	Emergency Generator	Central plant	1961	Retain
RML 28	High Containment Lab	Laboratory, Director's Reserve and Shared Laboratory Support	111590	Retain
RML 29	Shipping and Receiving	Shipping and Receiving	7525	Retain
RML 30	Visitor's Center	Visitor's Center	3562	Retain
RML 31	Admin and Computational Center	Administrative Services	29695	Renovate a portion of Building 31 to house the RML Computational Center.
RML 32	Vivarium	Veterinary Branch	4020	Retain
RML ARMCO-1	Vivarium	Veterinary Branch	2048	Phase 1: Renovate ARMCO-1 And ARMCO-2 and construct an addition to link the 2 structures. Phase 3: Relocate functions to the proposed Building G and raze ARMCO-1 and ARMCO-2
RML ARMCO-2	Vivarium Quarantine and Surgery	Veterinary Branch	2048	Phase 1: Renovate ARMCO-1 And ARMCO-2 and construct an

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
				addition to link the 2 structures. Phase 3: Relocate functions to the proposed Building G and raze ARMCO-1 and ARMCO-2
RML HD1		Maintenance Shops and Storage	3072	Relocate functions to the proposed Building C and raze HD 1-5
RML HD2		Maintenance Shops and Storage	1120	
RML HD3		Maintenance Shops and Storage	3482	
RML HD4		Maintenance Shops and Storage	512	
RML HD5		Maintenance Shops and Storage	864	
RML SS1		Equipment Storage	476	Relocate functions to the proposed Building C and raze SS 1-4
RML SS2		Equipment Storage	476	
RML SS3		Equipment Storage	476	
RML SS4		Equipment Storage	476	
RML T23		Maintenance Shops and Storage	4908	Relocate functions to the proposed Building C and raze T23
RML T25		Equipment Storage	2000	Relocate functions to the proposed Building C and raze T25

Building Name	Use Notes	Functional Unit	GSF	Potential Disposition
805 South 4th St.		Vacant	1867	Maintain historic structure
CONEX 1		Equipment Storage	1448	Relocate functions to the proposed Building C and raze CONEX 1

The Master Plan Update, shown in Exhibit 4-10, accommodates a potential campus employee population growth of 139 (40% growth) over the 20-year timeframe of the plan, from 372 currently to approximately 511. To support the growth in employees and required utility upgrades, the campus gross built area could potentially increase during the Master Plan period from 363,266 GSF to 506,126 GSF which includes the replacement of approximately 26,290 square feet of obsolete buildings to be demolished. Much of the building area growth would be attributable to construction of a central administrative building for campus-wide, shared meeting spaces (Building J); a computational laboratory building (Building H); expanded animal care facilities south of Building 25 (Building B); construction of a new research laboratory building west of Building 28 (Building G); and consolidation of maintenance activities in the southwest corner of the buildable site area (Building C). Solid Waste Management Facilities and Government Vehicle Storage would be constructed just inside the service entrance (Building D). An Interpretive Center would be built to the west of 805 South 4th Street. In the future, prior to construction of Building G, boiler and chilled water plant expansion will be needed at building 28.

Existing parking at the south perimeter and within the historic core would be retained and improved, and new surface parking would be consolidated along the north perimeter within an expanded site created by the 2010 land acquisition of property on the northeast corner of the site.

Recent land acquisition included an existing log home (805 South 4th Street) which provides a site for a public information facility, to be called the Interpretive Center, located outside of the protected site perimeter and with its own access and parking. In the 2009 RML Master Plan, NIH intended to renovate the historic log home to be the new Interpretive Center. While NIH still plans for the construction of an Interpretive Center, a renovation of the log home, which maintains its historic integrity and meets building safety standard for public use may not be the most efficient use of funds. The Master Plan Update recommends that a study be conducted to compare renovations of the existing log home versus new construction of an interpretive center to determine which option is preferred.

0 50 100 200 ft
0 25 50 m

Property Line
Security Fence
New Building

B RMVB Expansion Vivarium
C Maintenance Complex
D Waste Marshalling and Vehicle Storage Facility
G Laboratory
H Laboratory
J Administrative Building
K Interpretive Center

Exhibit 4-10: Illustrative 20 Year Master Plan Update

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4.2.3 Master Plan Component Concepts

The following paragraphs describe the fundamental recommendations of the Master Plan and 2015 Master Plan Update.

4.2.3.1 Functional Relationships

The primary concept underlying the functional relationships in the Master Plan is the idea of locating the research laboratories in close proximity to animal facilities and the animal facilities immediately adjacent to each other. In turn, these central laboratory/animal facilities would be flanked on the north by administrative and supply support and on the west by the maintenance complex. New animal facilities would be planned for expansion. Administrative and central supply functions would be consolidated central to the uses they serve. Utility functions would remain in their current locations for efficient utility distribution. Maintenance and Operations facilities would be consolidated in the southwest corner of the site away from staff and visitor traffic.

4.2.3.2 Open Space

A 100' wide open space buffer zone would be maintained along the site perimeter serving dually as a visual buffer as well as a security standoff to mitigate effects of any possible blast originating on the border of the site. This space would be landscaped to provide an attractive park-like setting while preserving needed views for surveillance. The 2015 Master Plan Update proposes surface parking at the north perimeter but no new structures within this buffer zone.

In the interior of the campus, the 2015 Master Plan Update proposes a Central Pedestrian Concourse with connections from the Quad and administrative support center to Buildings 13, 25, and the IRF. This concept is well suited for creating a "campus" atmosphere with spaces and opportunities for random encounters and interaction.

4.2.3.3 Building Patterns

All new development would follow the orthogonal grid established by existing buildings. This pattern would be continued and reinforced with the placement of new buildings. Advantages of developing the campus on a grid system include ease of integration with existing orthogonally oriented structures, efficiency of land use, fiscally responsible integration with, and extension of, the utility distribution system and the acknowledgment and further establishment of a clearly defined pattern to guide future growth.

4.2.3.4 Massing and Heights

The primary concept for building massing on the RML campus is concentrating the tallest structures along the central axis of the campus, with a transition in height to lower buildings toward the perimeter.

4.2.3.5 Circulation

The vehicular circulation concept for the campus provides a loop road at the building perimeter, outside the central pedestrian area, with access to surface parking outside the loop and primary building entrances to the interior of the road. The Master Plan would retain the two existing entries to the campus, the staff and visitor entrance from 4th and Grove Streets and the service entrance from 5th and Baker Streets. Two new emergency exits would be provided; one from the north parking lot to 6th Street, and the other from the south parking lot to 4th street, south of campus.

4.2.4 Land Use

Construction would be planned for the entire buildable area of the site, approximately 25 acres. T h e Floodplain and wetlands to the west would remain unbuilt. Refer to Exhibit 4-12 for a summary of pervious and impervious areas. Also see Exhibit 4-11.

Exhibit 4-11: Master Plan Update Land Areas

Category	Acres	% of Site
TOTAL SITE AREA	36.6	100
Total Pervious Area	19.6	54
Total Impervious Area	17.0	46
Roof (horizontal projection)	6.4	17
Pavement	10.6	29

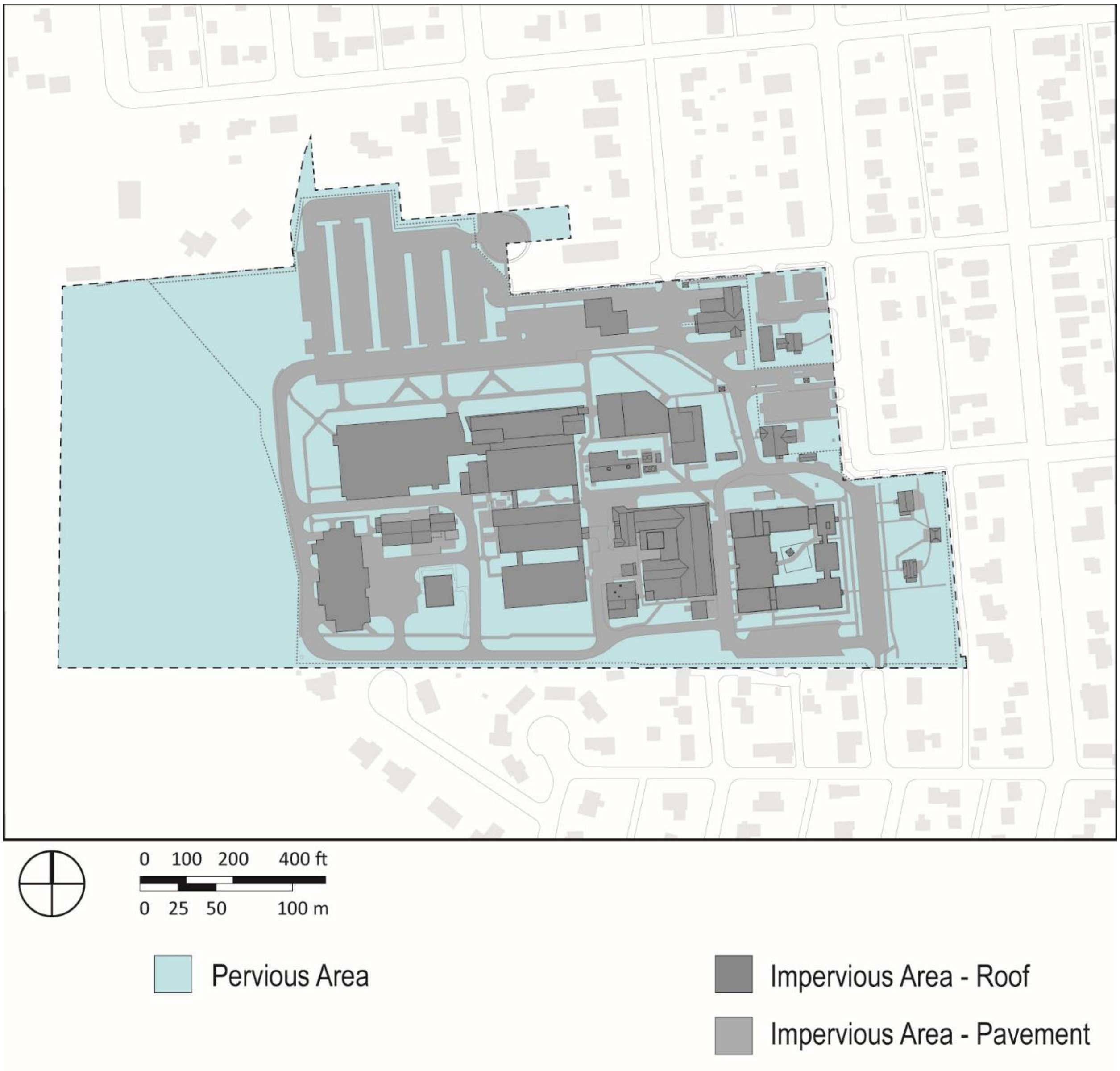

Exhibit 4-12: Master Plan Update Land Areas

4.2.5 Perimeter Buffers

In order to achieve the Master Plan goal of ensuring that development on the RML campus respects and enhances the environment of the surrounding communities, open space buffers would be created around the perimeter of the site. The 2015 Master Plan Update proposes buffer zones extending a minimum of 100 feet inward from the RML property line. The guidelines below define the character and activities which would apply to all buffer areas:

- Buffers would primarily be landscaped open space
- Existing screen landscaping would remain and to be enhanced with additional plantings
- Local, indigenous landscaping would be designed to frame attractive views into the campus
- Existing Buildings 1, 8, 9, 11, 29 and 805 South 4th Street would remain, although portions of these structures are presently within the proposed buffer
- No new permanent buildings would be allowed
- New Surface parking would be permitted only along the north perimeter; existing surface parking east of the Quad and a portion of the parking now located south of Buildings 3 and 5 would remain
- Bikeways and walkways would be allowed and encouraged
- Utility easements and associated infrastructure would remain
- Signage and lighting would be allowed for entry identification and direction

4.2.6 Open Space and Landscape

Indigenous plants integrate the man-made architectural elements into the natural landscape and reinforce the site's character. The guiding principles of the landscape plan serve to complement and reinforce the overall Master Plan by:

- Improving and strengthening the buffers between adjacent land uses,
- Using native plant materials,
- Minimizing water usage,
- Preserving mature trees as the core of landscape planning,
- Giving the plan regional identity and structure,
- Articulating the circulation system, and
- Creating a hierarchy of open spaces which shall serve to encourage interaction among RML staff and visitors.

4.2.7 Campus Amenities

Campus amenities can generally be divided into two groups: 1) employee/visitor services and 2) positive site features which enhance the use or image of the campus. The Master Plan addresses the issue of campus amenities in an effort to provide for the practical needs of employees as well as to create a campus setting which is conducive to attracting and retaining the highly qualified employees who are needed to carry out the mission of RML.

Amenity services would be programmed in accordance with the approved *Guidelines for Amenities and Services Within NIH Facilities*, December 2004. These would be located for easy access nearest to staff population centers. A frequently repeated need in the 2015 Rocky Mounty Laboratory Physical Security and Space Needs Assessment is conference room facilities and informal meeting spaces. These spaces would be included in the proposed Building “J”.

New or enhanced open spaces on campus, such as the Central Pedestrian Concourse, would offer meaningful site amenities both visually and is support of recreational purposes. These spaces could be utilized for outdoor dining, campus gatherings and spontaneous collegial interactions.

The landscaped area at the Historic Core could be extended across the 4th Street entrance area and provide an attractive view from the public side of the campus as well as passive recreation space. The Bitterroot Mountains to the west will remain as a beautiful backdrop for the campus plan.

4.2.8 Reuse and Demolition

Exhibit 4-9, shows the extent of building reuse and demolition proposed by the Master Plan Update. All newly constructed buildings and identified historic buildings would be retained. However, over the 20-year life of the 2015 Updated Master Plan, virtually all of the small, non-historic, older buildings would be replaced to consolidate functions in more efficient facilities.

4.2.9 Fire and Life Safety

Most buildings on the RML campus are planned to have a minimum clearance of 30 feet from other structures to provide for fire separation and emergency vehicle access. Primary access would be from the loop road. Emergency north-south travel would be accommodated through the Central Pedestrian Concourse and between the Quad and Building 13.

All major campus pedestrian pathways (such as the Central Pedestrian Concourse) should be designed to accommodate emergency vehicle loads. Landscape and path designs, thus, must allow for a clear path of 16 feet (min.) clear width and 14 feet (min.) clear height.

According to the 2010 RML Master Utility Plan, the existing water supply has sufficient capacity to meet existing and projected campus fire flow requirements. Additional booster pumps would be installed at individual buildings where needed.

4.2.10 Parking

It is important that the RML maintain adequate parking on site to meet employee and visitor needs and avoid parking shortages which would encourage employees to park in residential neighborhoods. To encourage ridesharing, the Master Plan recommends offering incentives for employees who carpool or vanpool to work, such as reserving preferential parking spaces for multi-occupant vehicle use.

The total parking supply for the 20-year plan is 375 personnel parking spaces (North lots; Quad; Visitor Center) plus 27 spaces at the Interpretive Center visitor lot at 4th and Baker Streets. This parking is anticipated to be adequate due to varied staff schedules.

4.2.11 Service Access

All delivery truck traffic would continue to access the RML campus at the 5th and Baker Streets service entrance; commercial traffic is planned to be restricted from further entry into the site by vehicle barriers. All supplies are broken out and inspected at Building 29 and internally delivered by RML staff or delivery personnel with RML staff escort. A new Waste and Vehicle Storage Facility, with a storage building and screened dumpster yard, would be located within the restricted service access area across from Building 29.

The 2015 Updated Master Plan proposes consolidating and simplifying service access on the RML campus to avoid conflicts with pedestrians and passenger vehicles, minimize the negative visual impacts of multiple service areas, and enhance site security.

4.2.12 Physical Security

Visitors are screened in the Visitor Center and deliveries are screened in the Shipping and Receiving Building. The current campus fence and entrances are in good condition and do not require upgrades.

The ORF Division of Physical Security Management shall continue to upgrade the security perimeter as changes in federal security guidelines dictate but they do not anticipate any changes that will affect the layout or use of the campus. All new construction would comply with the NIH Physical Security Design Guidelines to ensure the safety of persons, property, and research.

4.2.13 Waste Management

Disposal methodology and space requirements for waste management were estimated by RML based on a study, Medical Waste Disposal Alternatives at Rocky Mountain Laboratories, September

2007, which addressed municipal solid wastes, medical/pathological/lab wastes, hazardous chemical waste, radioactive waste and recycled materials.

Based on available information and the maturity of current technologies the study determined that, at this time, incineration of all medical type wastes is the technology best suited for RML, and the Master Plan proposes to retain the current incinerator. An incinerator scrubber was added in 2013 to assure the facilities compliance with all EPA regulations. The NIH and the RML will continue to consider alternative waste disposal technologies as these evolve and as campus operations and needs change in the future.

The study also identified waste streams from generation points to collection and disposal areas, and circulation provisions in the Master Plan incorporate these waste movement requirements.

4.3 FEDERAL REAL PROPERTY COUNCILS PERFORMANCE MEASURES

Refer to Chapter 3 for a description of the Federal Real Property Asset Management Performance Measures for the existing campus. This section analyzes the impact of the projected Master Plan Update if it is fully implemented. As previously mentioned HHS utilizes the following mandatory performance measures in the management of real property assets:

- mission dependency
- facility condition index
- utilization rate
- operating cost
- disposal of unneeded assets

Projected building performance metrics for existing buildings to remain and potential new buildings are summarized in **Exhibit 4-13**.

Exhibit 4-13: Federal Real Property Performance Measures for Master Plan Update

Building Name	Predominant Use Type	Mission Dependency	Condition Index	Utilization Code	Functional Suitability	Notes
RML-01	Lab	Critical	100	Utilized	Suitable	The Quad Laboratory Renovated
RML-02	Lab	Critical	100	Utilized	Suitable	The Quad Laboratory Renovated

Building Name	Predominant Use Type	Mission Dependency	Condition Index	Utilization Code	Functional Suitability	Notes
RML-03	Lab	Critical	100	Utilized	Suitable	The Quad Laboratory Renovated
RML-05	Lab	Critical	100	Utilized	Suitable	The Quad Laboratory Renovated
RML-06	Lab	Critical	100	Utilized	Suitable	The Quad Laboratory Renovated
RML-07	Lab	Critical	100	Utilized	Suitable	The Quad Laboratory Renovated
RML-08	Admin	Critical	100	Utilized	Suitable	Renovated to address security concerns
RML-09	Admin	Critical	100	Utilized	Suitable	Renovated to address security concerns
RML-A	Lab	Critical	100	Utilized	Suitable	The Quad Laboratory Renovated
RML-11	Admin	NMD	100	Under Utilized	Suitable	Changed to a NMD use to address security concerns
RML-13	Lab - Animal	Critical	97	Utilized	Suitable	Animal
RML-13B	Lab	Critical	100	Utilized	Suitable	Laboratory
RML-15	Storage	Critical	95	Utilized	Suitable	Radiological Storage
RML-22	Storage	Critical	100	Utilized	Suitable	Central Stock Room
RML-23	Light Ind	Critical	100	Utilized	Suitable	Incinerator with scrubber
RML-24	Light Ind	Critical	100	Utilized	Suitable	Emergency Generator
RML-25	Lab - Animal	Critical	99	Utilized	Suitable	High Containment Animal Holding and Lab
RML-26	Light Ind	Critical	100	Utilized	Suitable	Central Boiler Plant
RML-27	Light Ind	Critical	100	Utilized	Suitable	Emergency Generator

Building Name	Predominant Use Type	Mission Dependency	Condition Index	Utilization Code	Functional Suitability	Notes
RML-28	Lab	Critical	100	Utilized	Suitable	High Containment Lab
RML-29	Service	Critical	100	Utilized	Suitable	Shipping and Receiving
RML-30	Other Instit	Critical	100	Utilized	Suitable	Visitor's Center
RML-31	Admin	Critical	100	Utilized	Suitable	Lab, Admin and Computational Center
RML-32	Animal	Critical	100	Utilized	Suitable	Vivarium
805 South 4th St.	Vacant	NMD	Not Evaluated	Under Utilized	Not Suitable	Historic Structure
Building B	Animal	Critical	100	Utilized	Suitable	Veterinary Branch High Containment Animal Holding
Building C	Admin	Critical	100	Utilized	Suitable	Maintenance shops and storage
Building D	Storage	Dependent	100	Utilized	Suitable	Shipping and Receiving
Building G	Lab	Critical	100	Utilized	Suitable	Laboratory, Director's Reserve and Shared Laboratory Support
Building H	Lab	Critical	100	Utilized	Suitable	Laboratory, Director's Reserve and Shared Laboratory Support
Building J	Admin	Critical	100	Utilized	Suitable	Administrative Services
Building K	Admin	Dependent	100	Utilized	Suitable	Interpretive Center

4.3.1 Mission Dependency:

The category of each existing facility have been evaluated and, where needed, adjusted based on proposed renovations and changes of use. New facilities have been evaluated based on proposed functions. The following designations were used:

- "Mission Critical" - Without the constructed asset or parcel of land, the NIH mission is compromised.
- "Mission Dependent" - The asset does not fit into "Mission Critical" or "Not Mission Dependent" categories. The asset's primary function supports the Mission.
- "Not Mission Dependent" - The NIH mission is unaffected.

Each asset receives only one category designation. Where there are multiple functions for a facility, then the highest applicable mission dependency category is utilized. The evaluation is based on the facilities function under normal operations, not a catastrophic scenario.

Exhibit 4-14 shows that 98% of NIH facilities are proposed to be "mission critical". Less than 1% are proposed to be "mission dependent" and less than 1% are proposed to be "not mission dependent" (NMD).

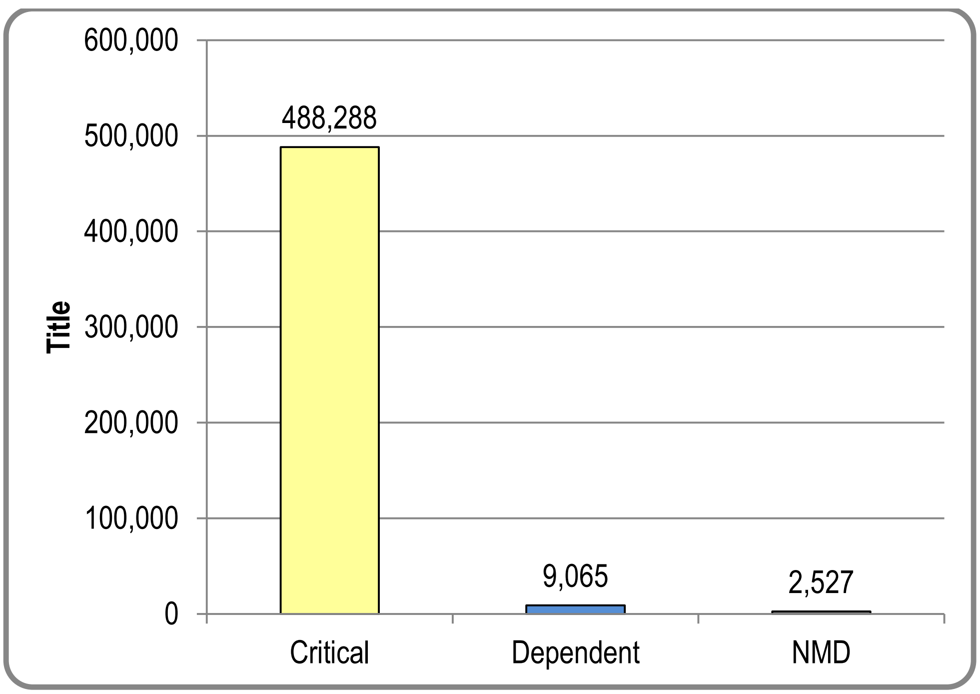

Exhibit 4-14: Proposed Master Plan Update Mission Dependence

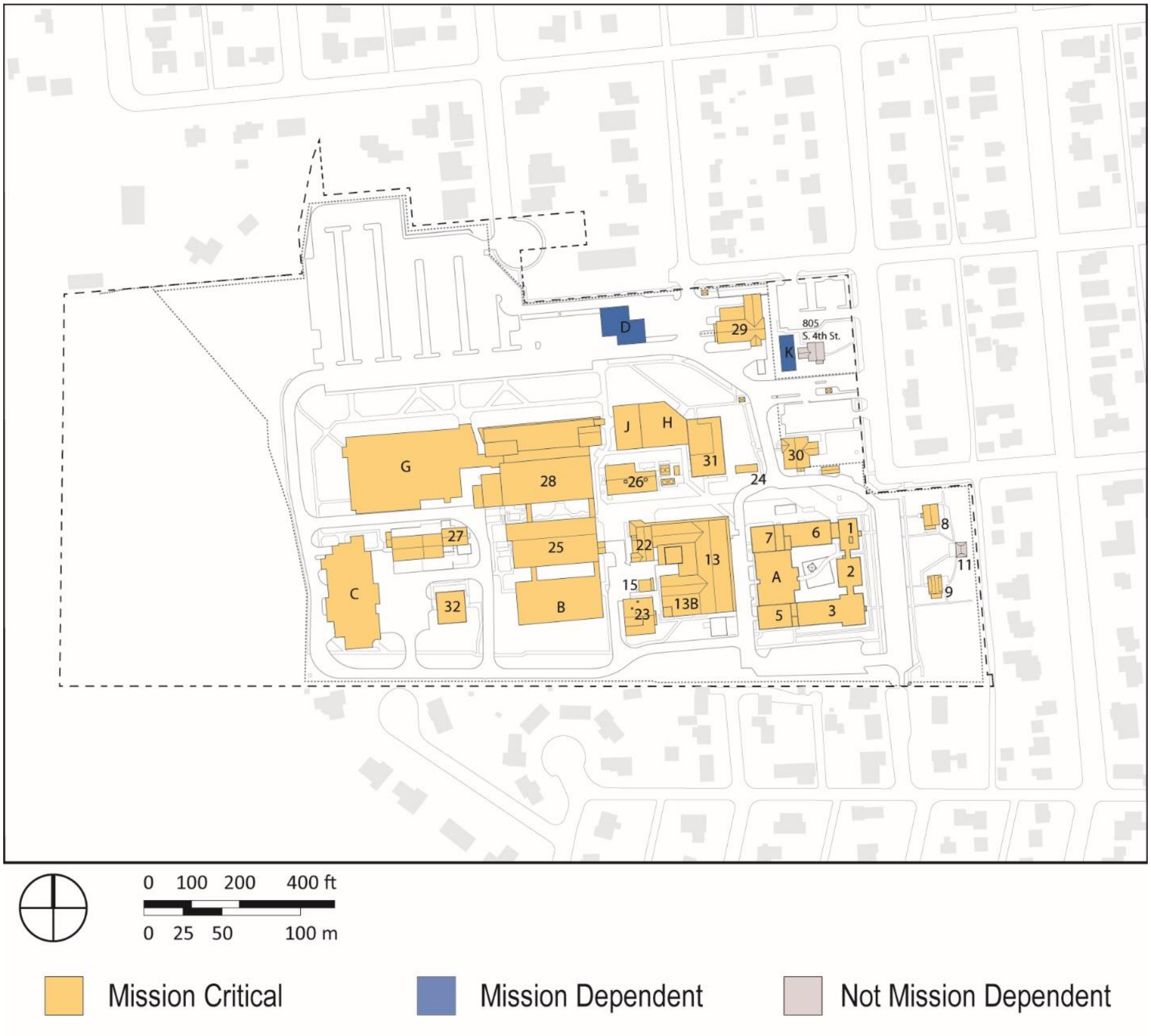

Exhibit 4-15: Proposed Master Plan Update Mission Dependency

4.3.2 Building Conditions

Building conditions on the RML campus are rated using a performance metric described in Chapter 3. The CI is calculated using the following formula:

By 2017 NIH is required to have a CI =90 or above for all its buildings. Currently all of NIH RML campus buildings (excluding temporary buildings and Building 11 which is not occupied) meet or exceed CI = 90. The proposed Master Plan Update would continue to maintain this high rating.

4.3.3 Facility Utilization

AS described in Chapter 3, NIH bases its facility utilization measurement on an annual census taken every summer. Summary of Facility Utilization

The proposed NIH RML Campus Master Plan Update Facility Utilization ratings are indicated in Exhibit 4-16 and summarized in **Exhibit 4-17**. These exhibits show that 99% of NIH facilities could potentially be "utilized". The remaining 1% is made up of Building 11 and 805 South 4th Street.

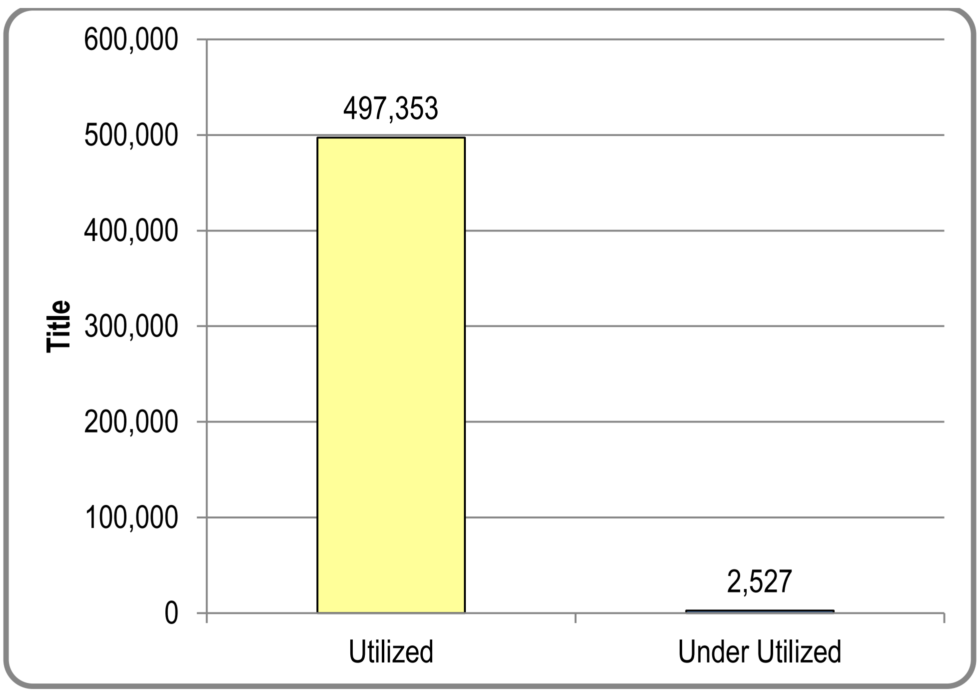

Exhibit 4-16: Proposed Master Plan Update Facility Utilization Chart

Exhibit 4-17: Proposed Master Plan Update Facility Utilization

4.3.4 Building Functional Suitability

Functional suitability is based on the ability of a particular structure to continue to be used effectively for the activity assigned to it. A summary of building functional suitability for the proposed Master Plan Update is graphically presented in **Exhibit 4-18** and **Exhibit 4-19**. 99.5% of buildings on the RML campus could potentially be considered functionally suitable. The only building that would not meet this standard is 805 South 4th St.

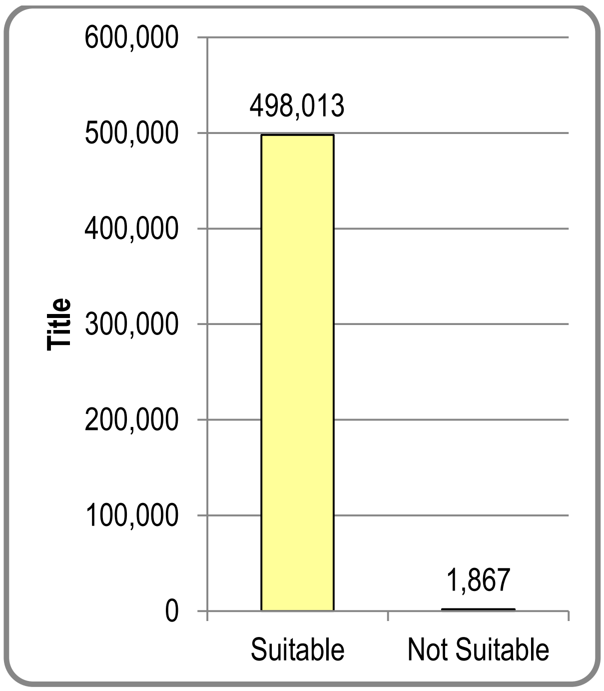

Exhibit 4-18: Proposed Master Plan Update Building Functional Suitability Chart

Exhibit 4-19: Building Functional Suitability

4.3.5 Operating Cost

NIH Office of Research Facilities and NIAID continue to work together to identify and implement opportunities for facility cost reductions by reducing the energy, water and material consumption on the campus.

4.3.6 Disposal Performance Measures

NIH evaluates existing buildings with life cycle cost analyses that compare major renovation to replacement costs. Where it is economically advantageous, obsolete assets are demolished and replaced with new state-of-the-art buildings capable of functioning at the highest level. Where the life cycle cost analysis reveals that renovation yields the best economic returns to the agency, the assets are renovated to provide further service.

The Proposed demolition projects in this Master Plan Update are either located along the property line (Building 12) and therefore functionally obsolete or temporary buildings and trailers (T-23, T-25, HD 1-5, SS 1-4, Conex 1, ARMCO 1 and ARMCO 2). Consolidating these spaces into modern larger structures is economically advantageous to the government.

Exhibit 4-20: Buildings to Be Demolished

4.4 REDUCE THE FOOTPRINT

When adding capital assets to the real property inventory, NIH shall conduct an alternatives analysis to identify opportunities to consolidate and dispose of existing assets, optimize the performance of the agency's real-property portfolio, and reduce associated environmental impacts. This shall be done in accordance with Management Procedures Memorandum (MPM) 2015-01, Implementation of the Office of Management and Budget (OMB) Memorandum M-12-12 Section 3: Reduce the Footprint. See Appendix A for an analysis of the RML Master Plan Update proposed projects impact on Reduce the Footprint.

4.5 UTILITIES

A Master Utility Plan (MUP) for RML was prepared in 2010. Projects developed for the Master Plan Update were coordinated with the MUP. In general, new projects will be planned to minimize the interruption of utility services to existing campus buildings.

4.5.1 Steam

Refer to **Exhibit 4-21**. Principal steam lines run beneath the service drive between the Quad and Buildings 13/13B, in the planned Central Pedestrian Concourse adjacent to Buildings 13, 26 and 31, and to the west of Building 25. The principal steam lines should not be disturbed or relocated.

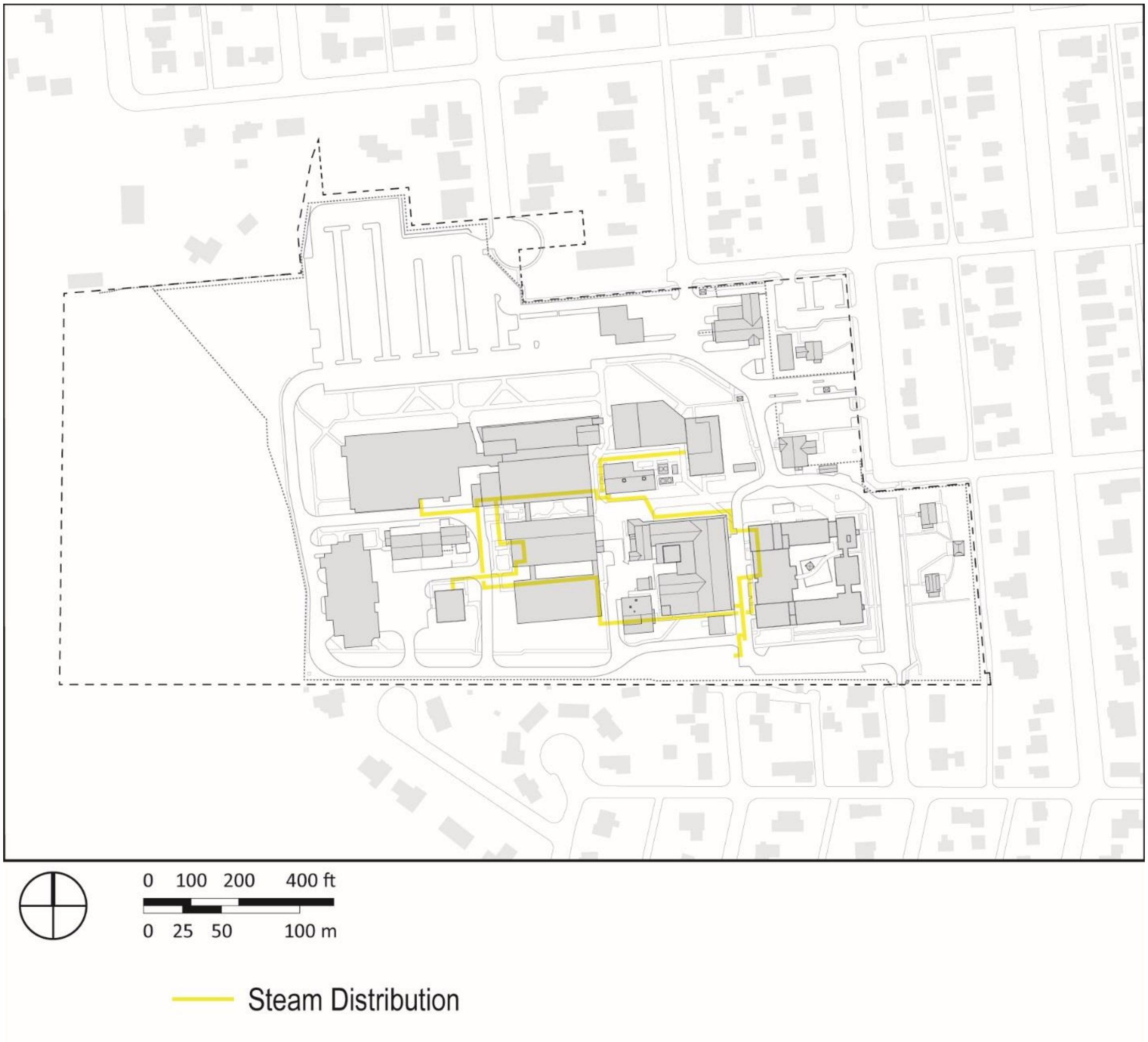

Exhibit 4-21: Projected Steam Distribution

4.5.2 Chilled Water

Refer to **Exhibit 4-22**. A critical chilled water line runs under the service drive between the Quad and Buildings 13/13B and across the planned Pedestrian Concourse. While the Master Plan does not anticipate new projects that would adversely affect this utility, construction that would affect this line is discouraged.

Exhibit 4-22: Projected Chilled Water Distribution

4.5.3 Natural Gas

Refer to **Exhibit 4-23**. A 6” gas main enters the site and runs under the projected loop road from the vicinity of the projected Long Term Storage Facility to Building 26. This is a critical utility which future construction should avoid disturbing.

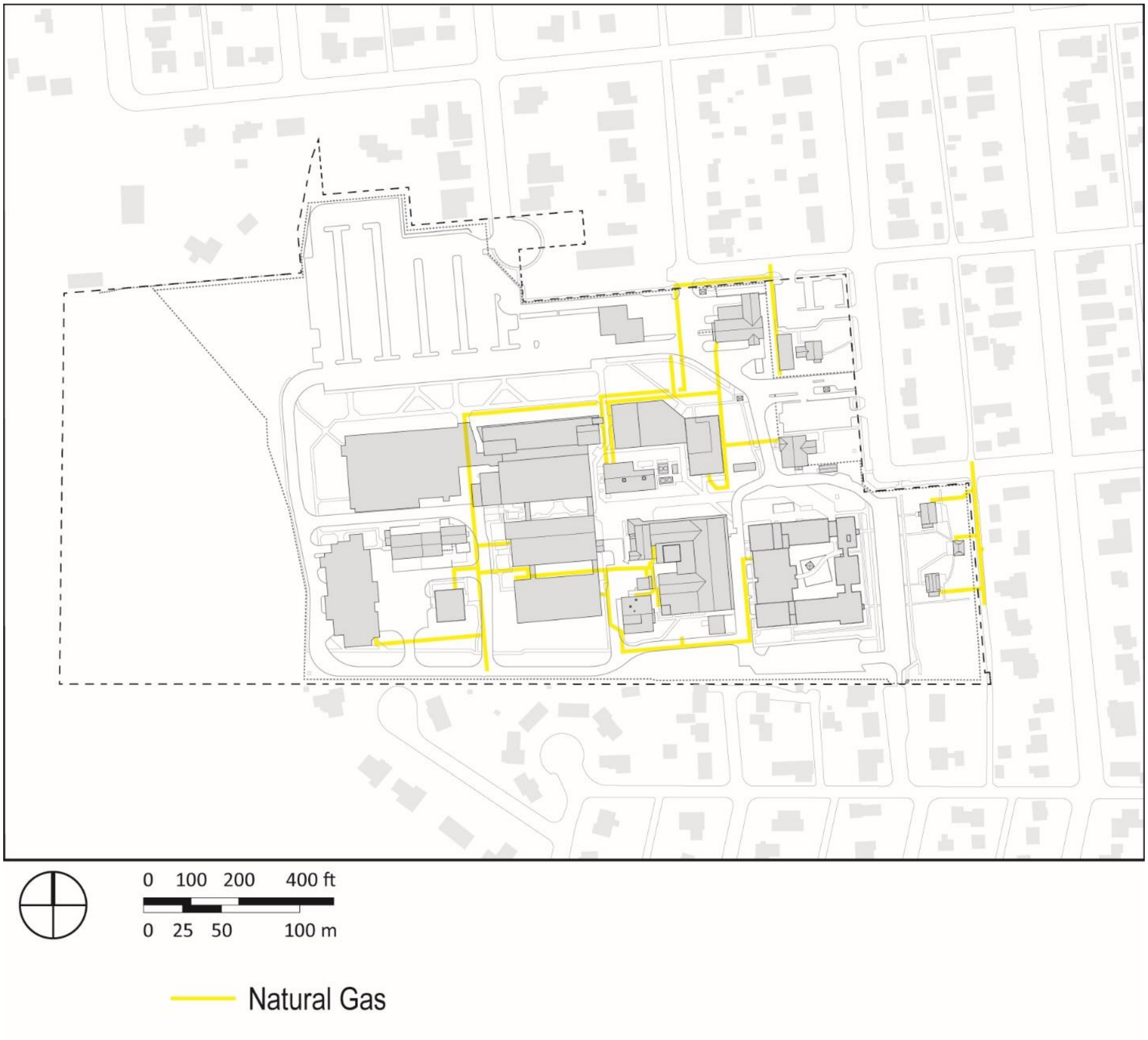

Exhibit 4-23: Projected Natural Gas Distribution

4.5.4 Power & Signal

Refer to Exhibit 4-24. Critical underground power and signal lines run under the projected Pedestrian Concourse, between Buildings 30 and 31, between the Quad and Buildings 13/13B, north of Building 28, between and west of Buildings 28 and 25, south of the ARMCO buildings, and in the western portion of the campus roughly on axis with the Central Pedestrian Concourse. Construction projects anticipated by the Master Plan that would affect these lines must retain service to existing buildings served by these lines throughout construction. Should the Building 28 plant expansion become necessary, this project must also be planned so that service to existing buildings is retained. The aerial lines providing power to RML have been modified to accommodate the future growth of the campus. These modifications are explored in greater detail in Chapter 3, Section 3.10.9.

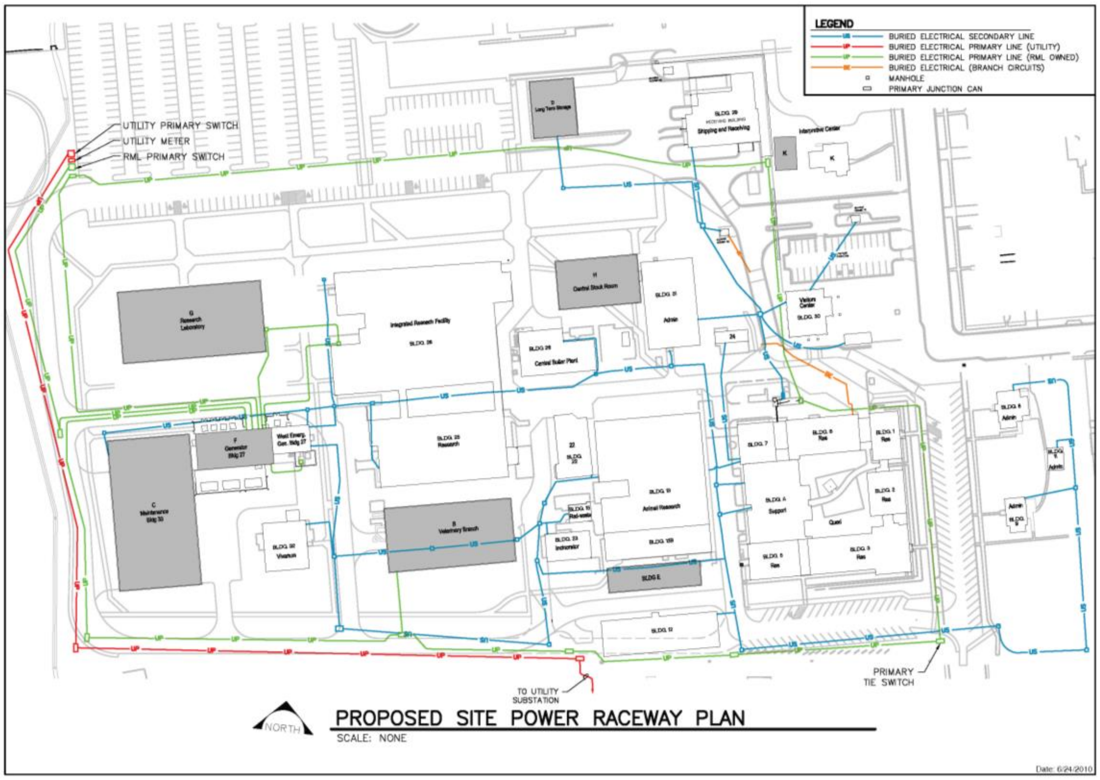

Exhibit 4-24: Projected Site Power Raceway Plan

4.5.5 Water

Refer to Exhibit 4-25. 2010 Master Utility Plan has projected daily use to be 139,500, gpd or 97 gpm and a 388 gpm peak instantaneous flow based on peaking factor of four. The existing booster pump station was designed to provide 1,400 gpm that allows 1,000 gpm for fire flow plus 400 gpm for facility use. The existing booster pump station and the distribution system should be adequate to meet the facility projected need to support the 20 year master plan.

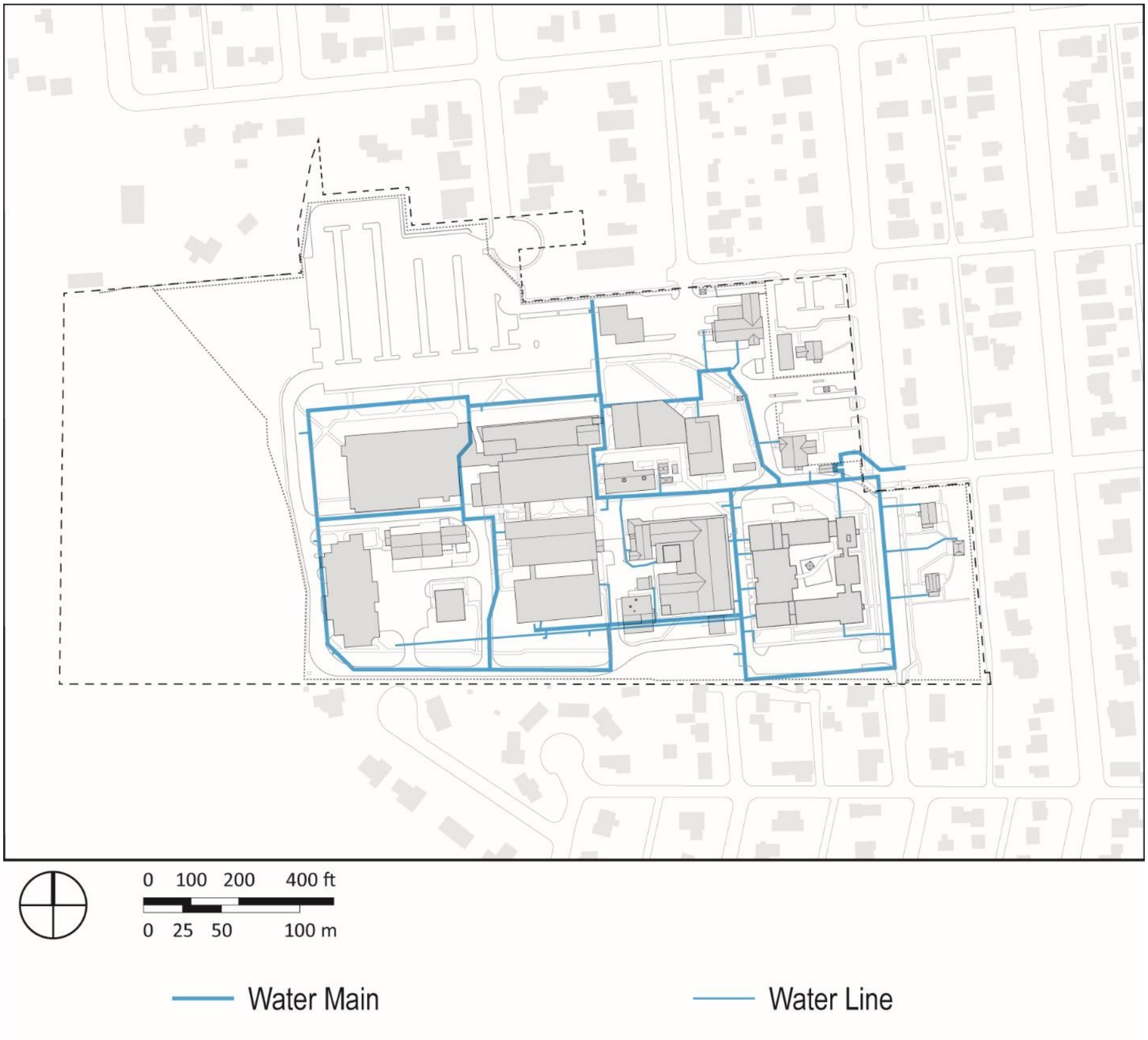

Exhibit 4-25: Projected Water Distribution

4.5.6 Sanitary Sewer

Refer to **Exhibit 4-26**. There are three 8-inch independent PVC sanitary mains discharging out of RML campus in the city sewer system. Each 8-inch sewer main laid at minimum grade has a maximum capacity of 346 gpm. The projected peak water usage under the 20-year growth option is projected to be approximately 388 gpm. Therefore, the combine capacity of the three-sewer main connections to the City is 1038 gpm which is close to three times required capacity to handle the projected peak usage for the entire campus. See above note about western main, it is near max capacity during short peak flows. Depending on how future demands are distributed among the sewer connections, water usage at the RML Campus could conceivable double without triggering a need to increase the capacity of the on-campus wastewater collection lines.

Exhibit 4-26: Projected Sanitary Sewer

4.5.7 Storm Water

The NIH is implementing Best Management Practices (BMPs) at its facilities to control the quantity and quality of its storm water runoff. As the Master Plan is implemented over the years, the NIH would strive to decrease storm water runoff as much as possible but with an overall goal of no net increase in storm water runoff from the site after full development of the site.

4.6 MASTER PLAN IMPLEMENTATION

Programming for growth under the Master Plan is phased over a 20-year period. Based on the anticipated program needs and funding limitations, new construction is spread over all four phases. Implementation of any of the projects that make up the Master Plan is dependent upon various actions, some of which are within NIH's or RML's control; others are not and are under the control of groups such as HHS or the Congress or a consequence of presidential priorities and mandates. The timing of actual construction at RML would be related to the level of future staff growth, the program-driven demands for the facility in question, the availability of funding to construct the project, and considerations such as the need to provide ancillary facilities to support the construction of primary facilities. For example, the research activities anticipated for Laboratory G could utilize expanded animal facilities, campus maintenance, general storage, waste management and parking.

Planned construction phasing is presented in

Exhibit **4-27** with required demolition and new construction areas by line item. Resulting gross area increases and demolition by function and phase are presented in Exhibit 4-28. Based on implementation planning, total gross building area at the end of the 20-year planning periods is 504,126 gsf.

A brief description of each of the projected Master Plan projects follows.

Exhibit 4-27: Implementation Phasing

Phase		Demolish (GSF)	Construct (GSF)
Phase 1	Renovate Building 8 for Administrative space		
	Renovate Building 9 for Administrative space		
	Renovate portion of Building 31 for a Computational Research Center		
	Renovate ARMCO-1 And ARMCO-2 and construct an addition to link the 2 structures		1,440
	Construct Building C for maintenance shops and storage		30,190
	Demolish Building T-23	-4,908	
	Demolish Conex 1	-1,448	
	Demolish HD 1-5	-2,804	
	Demolish T-25	-2,000	
	Demolish SS 1-4	-1,904	
	Landscape Improvements related to Phase 1 construction projects		
Phase 1 Total		-13,064	31,630
Phase 2	Construct Building 28 Chiller Addition		1,000
	Construct Laboratory G		70,000
	Construct Building D for a Waste Marshalling and Vehicle Storage Facility		5,665
	Relocate shipping and Receiving function to Building D. Renovate Building 22 for facility support functions.		
	Landscape Improvements related to Phase 2 construction projects		
	Construct Central Pedestrian Concourse		
Phase 2 Total		0	76,665
Phase 3	Construct Laboratory H		13,140
	Construct Building J for Administrative space, small meeting rooms, seminar rooms, archival storage, a training lab and a café		10,000
	Renovate the Quad to increase Utilization Rate, modernize meeting and conferencing spaces and house the Visual Medical Arts Branch		
	Relocate Admin and Visual Arts functions to Building 1		
	Landscape Improvements related to Phase 3 construction projects		
Phase 3 Total			23,140
Phase 4	Construct Vivarium Building B		34,315
	Construct Building K Interpretive Center		3,400
	Demolish ARMCO 1 and ARMCO 2	-5,536	
	Demolish Building 12	-7,690	
Phase 4 Total		-13,226	37,715
Grand Total		-26,290	169,150

Exhibit 4-28: Gross Area Increases and Demolition by Phase

	Program	Baseline	Phase 1	Phase 2	Phase 3	Phase 4	Total
Administrative Services	37972	37972	37972	37972	47972	40282	40282
Central plant	10681	10681	10681	11681	11681	11681	11681
Interpretive Center			0	0	0	3400	3400
Laboratory, Director's Reserve and Shared Laboratory Support	218816	218816	218816	288816	301956	301956	301956
Maintenance Shops and Storage	22450	22450	39576	39576	39576	39576	39576
Shipping and Receiving	10149	10149	10149	15814	15814	15814	15814
Vacant	1867	1867	1867	1867	1867	1867	1867
Veterinary Branch	57769	57769	59209	59209	59209	87988	87988
Visitor's Center	3562	3562	3562	3562	3562	3562	3562
Totals	363,266	363266	381832	458497	481637	506126	506126

Demolition			-13,064	0	0	-13,226	-26,290
New Construction			31,630	76,665	23,140	37,715	169,150

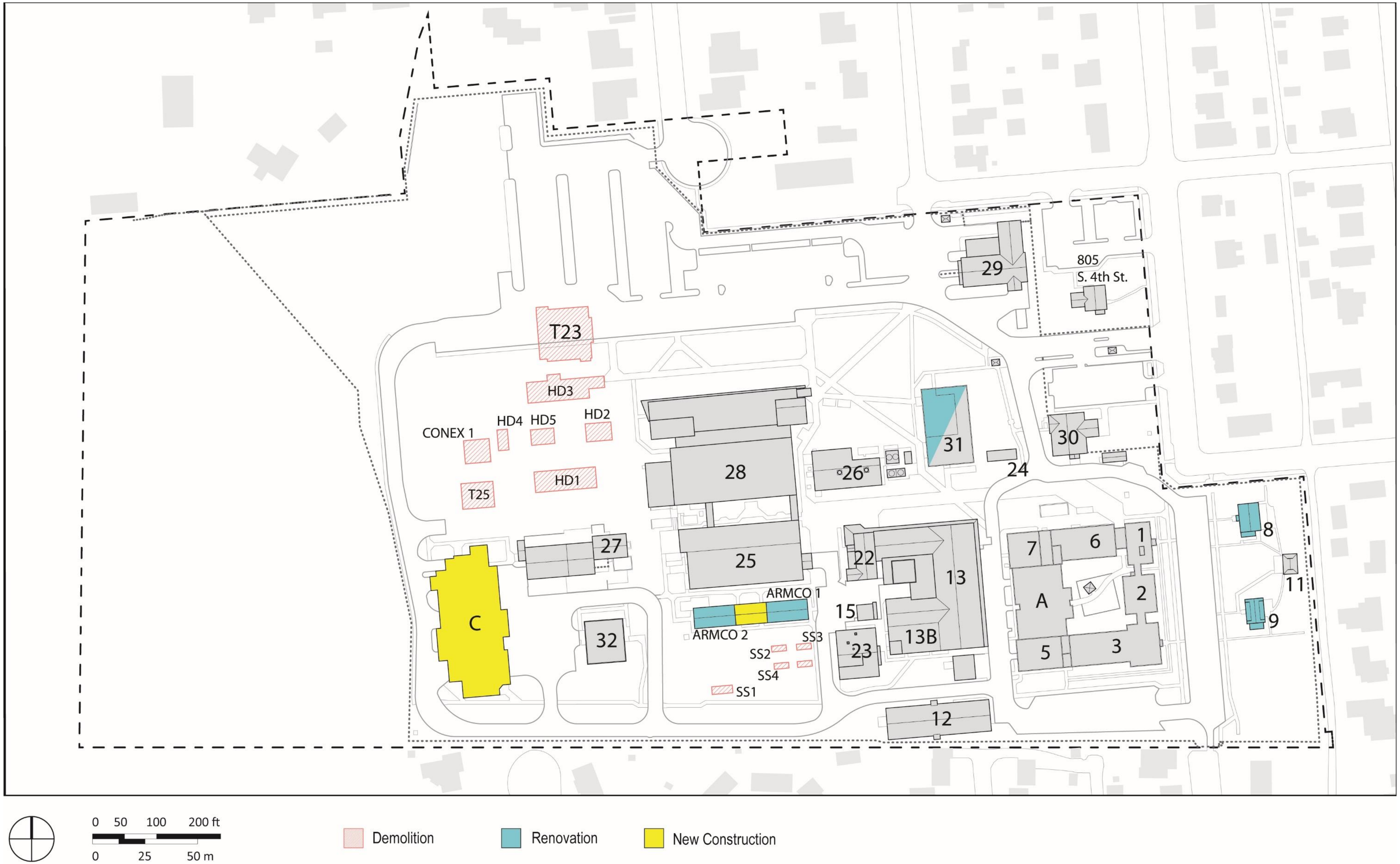

Exhibit 4-29: Phase 1 Implementation Diagram

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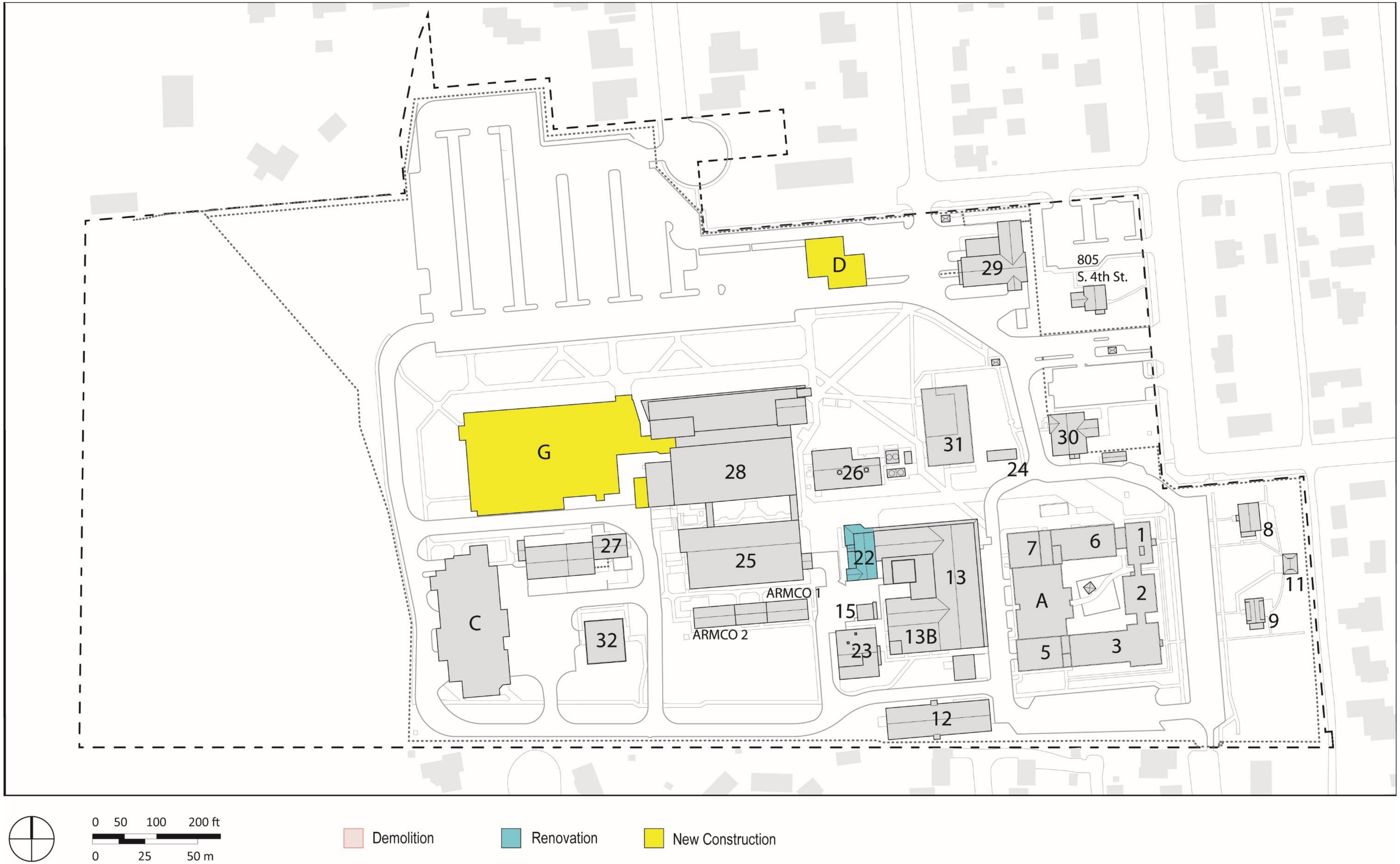

Exhibit 4-30: Phase 2 Implementation Diagram

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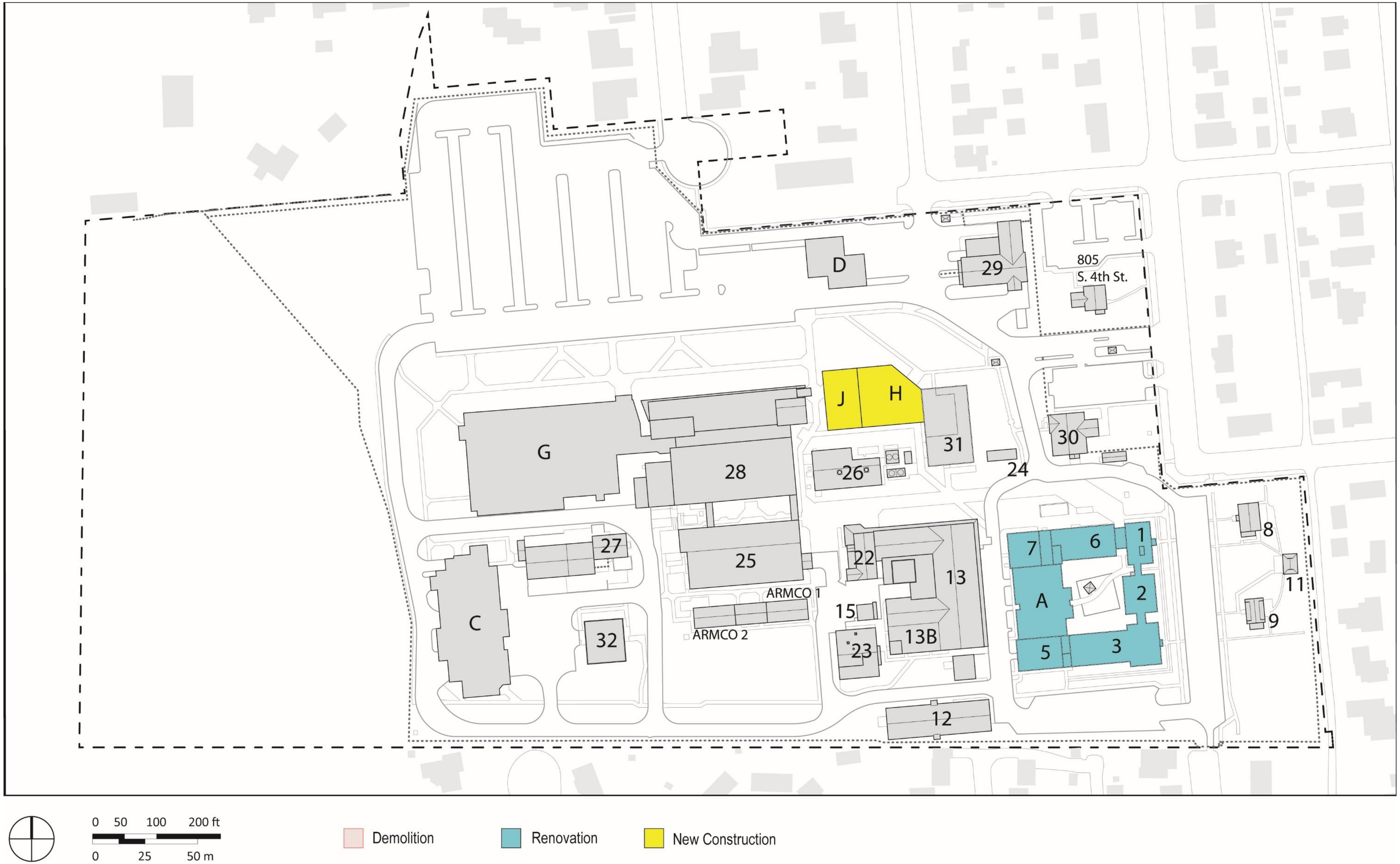

Exhibit 4-31: Phase 3 Implementation Diagram

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Exhibit 4-32: Phase 4 Implementation Diagram

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4.7 RML MASTER PLAN UPDATE PROJECTED PROJECTS

4.7.1 Maintenance Shops and Storage and Equipment Storage, Building “C”

Current maintenance staff at RML is located in temporary leased trailers in the northern portion of the site. With future expansion of the campus maintenance responsibilities will continue to grow. The Master Plan calls for constructing a new, approximately 30,300 gsf Maintenance Complex (Building “C”), with offices, shops, support space, conference/break rooms, maintenance, storage areas, lockers, showers, and toilet facilities and general equipment storage in the far southwestern corner of the campus. The support facility would provide larger and more functional space for current and future maintenance personnel as well as the NIH Police. In addition, paved areas would be planned on the east and west sides of the main building to park maintenance and public safety vehicles and allow for outside storage of maintenance-related equipment. Screen walls and landscaping would be used to screen unsightly views of the yard from off-site areas. The following structures can be razed when Building C is activated: T-23, HD 1-5, T-25 and Conex 1.

4.7.2 Waste Marshalling and Vehicle Storage Facility, Building “D”

This proposed 5,665 gsf facility, located on the north edge of the campus west of the Shipping and Receiving Building, would serve as a marshalling facility for items RML intends to hold for a short period of time before they would be removed from campus by individuals or private contractors. These items would include recycled waste, general waste, and surplus equipment awaiting donation or removal from campus. A portion of the building would also be used to garage ORS vehicles required for emergency response. In addition to the building, an outside storage yard would contain closed compacting-type dumpsters for trash and recycled waste. The yard would be screened from off-site views via an attractively designed screen wall.

4.7.3 Laboratory “H”

RML NIAID needs flexible and scalable IT infrastructure to support unpredictable computational and storage growth. Laboratory “H” is envisioned as a new computational research center that will be needed as the Building 31 computational research center expands. This new computational research center and related administrative support space needs to accommodate growth for next 20 years. It is envisioned as a 2 story, 13,140 gsf facility.

4.7.4 Building "J"

A 10,000 gsf Administrative building is planned to accommodate the following program needs:

- Administrative Space: NIAID is finding that locating their administrative support services on the RML campus provides a stable, cost effective employee pool. Additional personnel are being added to the procurement function on the RML campus.
- Conference and Collaboration Space: There is a growing requirement for scientific training and collaboration spaces on the campus. A large auditorium with capacity to accommodate RML staff is needed as well as smaller meeting spaces, a café and a training lab.
- Archival storage: The lower level of this facility should be dedicated to long term storage for biological study samples.

4.7.5 Research Laboratory Building "G" and the HD Complex

Research Laboratory Building G, would be a new, two-story plus basement, laboratory building located in the western portion of the campus in an area presently occupied by the HD Building complex which houses campus maintenance activities. This facility would house the functions for advanced research into Zoonotic pathogens and agents. With different agents or pathogens being classified or reclassified as 'Select Agents', this facility will provide a safe working environment for these agents. This facility is being designed for BSL-2 and BSL-3 Laboratories, ABSL-3 Animal Housing and USDA BSL-3Ag Animal Housing. USDA BSL-3Ag work done in BSL-3 Laboratories will be classified as USDA BSL-3Ag and the space will be designed for these requirements.

The building is approximately 40,091 NASF. The gross square footage, from the first and second floor conceptual layout drawings, is approximately 70,000 gsf. This does not include the mechanical penthouse, interstitial mechanical floors or the undeveloped space in the basement.

The new Building "G" would be connected at the first floor to the western side of building 28 which would allow the buildings to share a lobby, security screening, and a small lounge area. Building "G", with interstitial floors and a large mechanical penthouse, will likely be the tallest building on the RML campus at approximately 75'-0" from grade to the top of the mechanical penthouse. The mechanical penthouse will be set back from the main roof parapet to create a perceived height of approximately 45'-0".

Exhibit 4-33: Conceptual Elevation of Laboratory Building "G" From RML Building G POR, August 24, 2012

4.7.6 Vivarium Building "B"

NIAID research would be enhanced by animal research and holding facilities for exotic animals from the field (i.e. bats and birds), native animal quarantine (i.e. squirrels) and ABSL- 3 Non-human primate research space.

4.7.6.1 RMVB Expansion—Building "B"

The RMVB expansion would be planned as a new, 34,300 gsf, one-story plus basement, animal holding and research facility in the south-central area of the campus on land currently occupied by the ARMCO buildings south of Building 25. With Building "B" in place, animal space on the campus would increase by approximately 26,000 gsf, from 37,200 to 63,200 gsf.

4.7.6.2 AMRCO Vivarium

A specialized Vivarium building would be planned by renovating ARMCO-1 and ARMCO-2 and construct an addition to link the 2 structures. The addition is currently programmed as 1,440 gsf but further study is needed for the exact size.

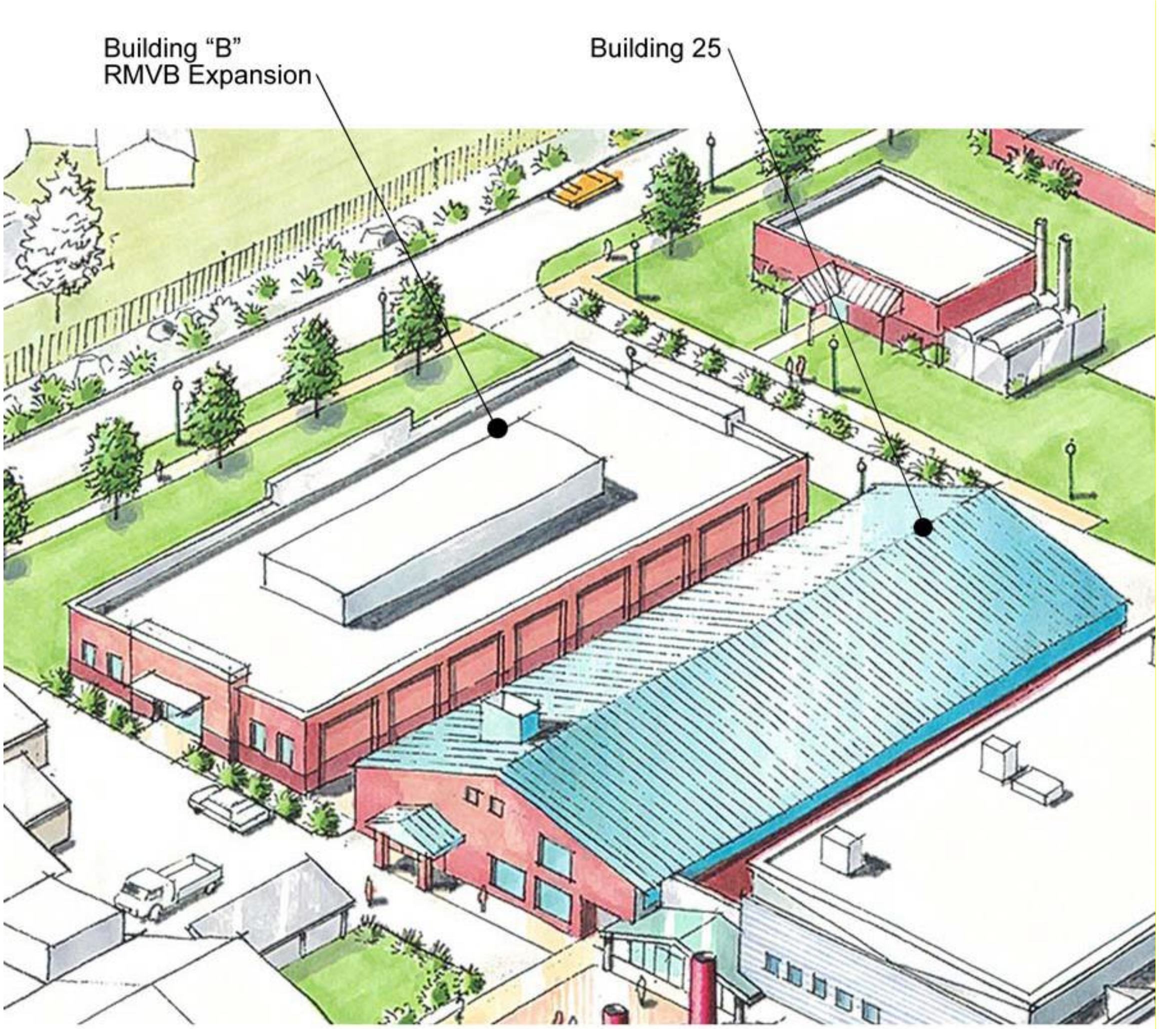

Exhibit 4-34: Conceptual Rendering of Building B

4.7.7 Interpretive Center, Building "K"

A 3,400 gsf structure would be built on newly acquired property located on the northeast boundary of the campus. The Center would be planned for school groups on field trips or others interested in the history of the campus. The Master Plan expects that visiting classes would consist of no more than thirty students. Parking for a small number of personal vehicles (and possibly a school bus) have been constructed in anticipation of this project and to provide visitor overflow parking today.

Exhibit 4-35: Conceptual Rendering of the Interpretive Center entry

4.7.8 General Site Improvements

4.7.8.1 Pedestrian Concourse

A pedestrian precinct would be established within the interior portion of the campus on the axis of Grove Street extended to provide a campus focal point and reduce potential pedestrian/vehicle conflicts. Vehicles would not be permitted within the precinct, except for emergency vehicles. The area would have special paving materials and attractive and well-maintained landscaping. Additional green space would be distributed throughout the site and along the perimeter of the campus to make it more visually appealing and pedestrian-friendly.

Exhibit 5.4.2c- Conceptual Rendering of the Pedestrian Concourse

Landscaping (emphasizing native plant materials), durable site furnishings (benches, trash receptacles, bicycle racks, etc.) and site signage would be improved and coordinated. Attractive pedestrian-scale light fixtures, matching the campus standard, would be provided along walkways and at building entrances. The use of banners would also be encouraged to add visual interest and color to the campus. The plan also recommends placing overhead utilities underground.

4.7.9 Off-Street Parking Expansion

The Master Plan Update would provide for expanding employee parking on the campus to 375 spaces to accommodate planned growth and satisfy security requirements. This also involves consolidating parking that is now scattered throughout the site, removing it from the center of campus. This, in turn, would create a more favorable pedestrian environment in the center of campus. Parking to be expanded in the north lots would be phased, to the extent practical, to coincide with phased campus Master Plan development. A portion of this work was completed in the first phase of the 2009 Master Plan. The remainder of the project is proposed for Phase 2 of the Master Plan update.

5 DEVELOPMENT GUIDELINES

5.1 INTRODUCTION

Development guidelines are included in this Master Plan to quantify and/or further define the general concepts and planning intentions set forth in Chapter 4. Although there is flexibility within the Master Plan, certain key relationships, patterns, and standards should be adhered to and considered when developing site or building projects to ensure that the desired functional features and campus character are achieved. The Development Guidelines define these key elements and provide recommendations for their implementation.

Subjects addressed in this chapter include issues of building size and scale, definition of open spaces, site character and quality, as well as access and circulation. Considerations for implementation of the Master Plan are also included.

5.2 BUILDING SITING AND OPEN SPACE GUIDELINES

5.2.1 Standoff and Setback

This Master Plan includes security standoffs between occupied buildings and potential threats from explosives as well as recommended setbacks for aesthetic reasons. At the perimeter of the site, measured from the vehicle barrier, the standoff should exclude any new employee occupied buildings. Buildings that are located toward the perimeter of the site must be designed in close consultation with the NIH Division of Physical Security. These facilities would need to mitigate potential blast effects by a combination of distance and construction. The National Institutes of Health (NIH) shall conduct a threat and risk assessment to establish design assumptions for blast charge weight for any new construction project. Standoff design criteria should adhere to NIH Security Guidelines. However, owing to the relatively small size of the Rocky Mountain Laboratories (RML) campus, the typical standoff of 250 feet cited in the Guidelines is prohibitively restrictive for future campus development. The standoff for RML should therefore be maintained at 100 feet throughout the campus perimeter, so that any and all new construction with this standoff distance should be designed with sufficient hardening in compliance with the Guidelines. The Interpretive Center, anticipated to occupy the site of the pioneer cabin located at the northeast corner of the existing campus, is envisioned to be open to the public and is therefore considered outside the secure perimeter. Thus it is not subject to the standoff requirements.

On a campus-wide basis, the Master Plan proposes general patterns of setbacks for buildings from the loop road to control density, ameliorate the scale of buildings, and ensure the development of a "campus" character for the site. Along the loop road, new buildings should generally not be any closer than 25 feet from roadway curb lines.

Within the campus there is a planned open public space, or Central Pedestrian Concourse, which is described in greater detail in Chapter 4. The dimensions of this area, approximately 80 feet by 1000 feet, are defined by existing Buildings 1, 6, 7, 13 and 22 to the south and 30, 31 and 26 to the north. Buildings 28 and 25 mark the western boundary of the space while to the east it is open to the Grove Street approach to the campus in the east. Exterior modifications to or replacement of the buildings that define this space should strive in so far as scale, materials, colors and texture to enhance the public nature of the resultant plaza and to reinforce the objective of the plaza as a central organizing and gathering spot for the campus. New buildings would not be sited inside the plaza area. Existing mechanical equipment within boundaries of the plaza should be relocated, if possible and if not possible, they must be screened. The existing covered walk at Building 13 should be enhanced and extended along the southern border of the concourse.

A second open public space that links the Primary Campus Entry to the Pedestrian Concourse is planned between Buildings 30 and 31. As with the Pedestrian Concourse, new building construction should not be considered inside this area, and future modifications to the facades of Buildings 30 and 31 should strive to enhance the public nature of this secondary concourse.

5.2.2 Building Heights

5.2.2.1 General Campus Height Plan

Heights have been arranged to create a coherent pattern among all campus buildings, in order to give a sense of hierarchy or prominence to the most important structures and to minimize adverse impacts on the surrounding community. As noted in Chapter 4, Building 28 and the Quad are the tallest buildings on campus, at 52’ and 50’, respectively but Building G, with interstitial floors and a large mechanical penthouse, would likely be the tallest building on the RML campus at approximately 75’-0” from grade to the top of the mechanical penthouse. The mechanical penthouse would be set back from the main roof parapet to create a perceived height of approximately 45’-0”. New construction should be no higher than these buildings to maintain their visual prominence as centers of campus research.

5.2.2.2 Critical Areas

Critical Areas include: the surrounding campus neighborhood, the proposed campus concourses, the historic Core that includes the Quad and the nearby residences, the Flood plain Trail as well as the aforementioned perimeter setbacks. The Master Plan minimizes the effects of new construction on neighboring areas off campus.

Within the campus, special attention has been given to creating appropriately scaled open spaces and relationships between new and existing buildings. Areas of significant attention to scale issues include: the Central Pedestrian Concourse; development near the Historic Core; the Campus Entry; the Interpretive Center; the Floodplain Trail; and the areas within the campus setbacks or standoffs.

5.2.3 Ground Level Activity and Use

All campus buildings should present a readily apparent accessible entrance at ground level. Building entries should be oriented to address streets, the two concourses and front major spaces rather than being oriented to face the perimeter fence.

In particular, ground level activities and uses are encouraged around the Central Pedestrian Concourse. This area is intended to become the campus' central meeting place for large outdoor gatherings. Creation of new or enhancement of existing building entries that allow for ground level activities opening onto the Concourse will aid in creating this sense of vitality and centrality.

Pedestrian movement can also add to the vitality of public spaces on campus. Spaces should be designed to accommodate and encourage pedestrians comfortably. Walkway surfaces and edges within the major open spaces should be of high quality materials, shaded where practical, and equipped with seating and furnishings where appropriate. Buildings around the major open spaces should also include arcades to shelter pedestrian movement in inclement weather.

5.2.4 Density and Bulk

Maintaining a "campus" character and image for the site is an important aspect of the Master Plan and the manner in which open space is arranged on the campus is critical in establishing the image. To ensure that an appropriate proportion of open space and landscape is maintained, it is important to control the density of buildings on campus. Infilling central open spaces shown in the Master Plan is discouraged as this may diminish the character and quality of prime open spaces, as well as impede views and light available to other buildings.

5.2.5 Rooftop Elements

Rooftop elements such as parapets, penthouses, and antennas including satellite and microwave dishes should be carefully designed to ensure architectural compatibility and minimize their visual impact on the skyline and installed at the lowest possible elevation above the roofline, and screened to the extent practicable from public view Mechanical and elevator penthouses should create visually attractive rooflines for the campus. These elements should be integrated into the architectural expression of the building, and may be articulated as an attic story or hidden within the roof form of the structure. All rooftop equipment should be screened from view using materials consistent with the major building facades.

Rooftop antennas which cannot be screened should be placed in association with penthouse structures so as to avoid the appearance of a freestanding object on the roof. Antenna and mounting materials should be unobtrusive and of a color that blends with surrounding buildings. Antennas should be protected against corrosion, securely mounted, and secured from unauthorized access.

Consideration should be given to developing on site solar capacity to accommodate portions of the campus power requirements. Rooftops provide an excellent location for the installation of solar collectors. As with other rooftop elements, the installation of solar collectors should be carefully considered for location and visual impact.

5.3 HISTORICAL AND ARCHEOLOGICAL GUIDELINES

5.3.1 Historical Guidelines

The Quad, comprised of Buildings 1, 2, 3, 5, 6, 7 and A, dates back to 1928, when Building 1 was completed. As discussed in Chapter 3, the eastern portion of the campus contains structures that together comprise the Rocky Mountain Laboratories Historic District which was listed in the National Register of Historic Places in 1988 (NRHP # #88001274) The newly acquired 1 ½ story building at 805 South 4th Street is listed as the Conway House on the National Register of Historic Places (NRHP #88001291).

It is possible that other buildings, upon reaching 50 years of age, shall be determined eligible for listing. Under Section 110 of the National Historic Preservation Act, federal agencies are required to identify and evaluate historic resources and to ensure that the resources are managed and maintained in a manner that is sensitive to their historic, archaeological, architectural, and cultural values. The NIH is committed to continuing to evaluate the potential historic significance of buildings that have reached 50 years of age. The NIH acknowledges that consultation with the State Historic Preservation Officer (SHPO) and other interested parties shall inform any proposed changes to listed properties in full compliance with. Section 106 of the National Historic Preservation Act requires government agencies to take into account the effects of planned undertakings on historic resources prior to approving funding for the undertaking.

The Secretary of the Interior's Standards for Rehabilitation provide basic principles to guide work undertaken on historic buildings. The Standards are as follows:

- A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its environment.
- The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
- Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.
- Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
- Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a property shall be preserved.
- Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of distinctive features, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
- Chemical or physical treatments, such as sandblasting, that can cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
- Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
- New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
- New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

5.3.2 Archeological Guidelines

Based upon recent ly completed site surveys and reviews of the local database, there are no known potential sites within the campus. If a sensitive area is encountered, the site must be evaluated and recommendations for appropriate sampling, recovery of artifacts, or protection in place must be prepared as necessary. It is possible, but not probable, that an alternative building site would have to be chosen or construction delayed if the archeological site were determined to be of great importance. In general, artifact recovery is preferable to avoidance since the historic and archeological value of most sites lies in the information obtainable from the artifacts.

The survey, evaluation and mitigation work (if required) should be completed during the planning of individual building projects and prior to the start of any construction. This releases the site for construction and avoids delays and additional costs once construction is underway.

5.4 CIRCULATION GUIDELINES

A Goal of the Master Plan is to create a campus that is pedestrian-oriented, that promotes walking as the primary means of circulation, and that creates active spaces for gathering. The urban design strategies employed in the Master Plan create a pedestrian-oriented focus for the campus.

The Central Pedestrian Concourse and the connecting main entry gate pedestrian concourse create a vehicle free zone in the center of the campus with spaces for gathering and interaction, and a primary pedestrian. The plan encourages pedestrian to use the Central Pedestrian Concourse by suggesting building entrances and lobbies be placed on central green. The reduction of paved areas and surface parking, and the clarification of the roadway system are intended to promote walking on campus. Closing some service roadways to through traffic will help to create a safer pedestrian environment.

5.4.1 Vehicular

Vehicular access to the RML Campus is currently achieved by means of two existing entrances; the staff and visitor entrance located along 4th Street near Grove Street and the service vehicle entrance adjacent to the intersection of 5th and Baker Streets. The campus also has two emergency vehicle exits to facilitate evacuations, if necessary. One is located at 6th Street where it terminates at the northern boundary of the site and the other is at 4th Street where the roadway terminates in the southeast corner of the campus. None of these entrances are anticipated to require traffic signals to control traffic flow to and from the campus.

There is a new two-way limited access campus loop road around the north, west and south portions of the campus, where it meets the existing parking area of the Quad. This loop road shall be gated so that only government vehicles and escorted delivery vehicles can access these portions of campus. There are also several two- way service lanes to permit access from the loop road to existing building service entries. The locations of these roadways are presented in **Exhibit 5-2**. The loop road and most service lanes are proposed to be 24 feet wide.

5.4.2 Parking

Under NIH Security Guidelines, the existing parking areas at the southeast side of the Quad and south of the ARMCO buildings are permitted to remain, but new parking areas should not be planned adjacent to campus buildings. In the future, additional parking will be accommodated in the setback area on the north side of the campus. The use of multi-story parking structures is discouraged; surface lots are preferred. Consequently, parking for the additional campus population anticipated by the Master Plan should be accommodated in the properties that were recently acquired on the north side of the campus. Planting areas should be located between parking rows and interspersed between parking spaces to provide visual relief and create shade where possible. Premium parking spaces will be allocated for compact cars, low emission cars, hybrid electric cars and car pooling vehicles.

RML will incorporate Best Management Practices (BMP) and Low Impact Development (LID) as appropriate in its approach to parking lot construction, including 'hybrid' paving such as hard surface access roads and permeable paving for parking spaces, natural vegetated separation strips and use of recycled materials. Other examples of LID practices that may be incorporated in parking areas include, but are not limited to, bio retention cells to filter storm water, infiltration trenches, sumps, and bio swales incorporating native vegetation.

5.4.3 Service

With few exceptions, all commercial trucks would continue to enter the site through the service entrance, where they would drop off deliveries and/or pick up materials from Building 29 or Building D. On-campus service vehicles would distribute delivered materials from Building 29 to campus buildings and carry deliveries, recyclables, or waste from the campus to Building 29 or Building D.

The number of access driveways on the internal loop road has been limited by providing shared service/delivery areas for groups of buildings. This consolidation of the service/delivery areas is intended to minimize conflicts on the internal road system.

The design of the access driveways from the internal loop road system should be provided with adequate sight distances and proper turn-around areas for service vehicles. In general, access driveways for service/delivery vehicles and employee or visitor passenger vehicles should be separated from one another. Although these criteria may not be feasible in all cases, the objective should be to reduce the possibility of the access driveway being temporarily blocked by a service/delivery vehicle.

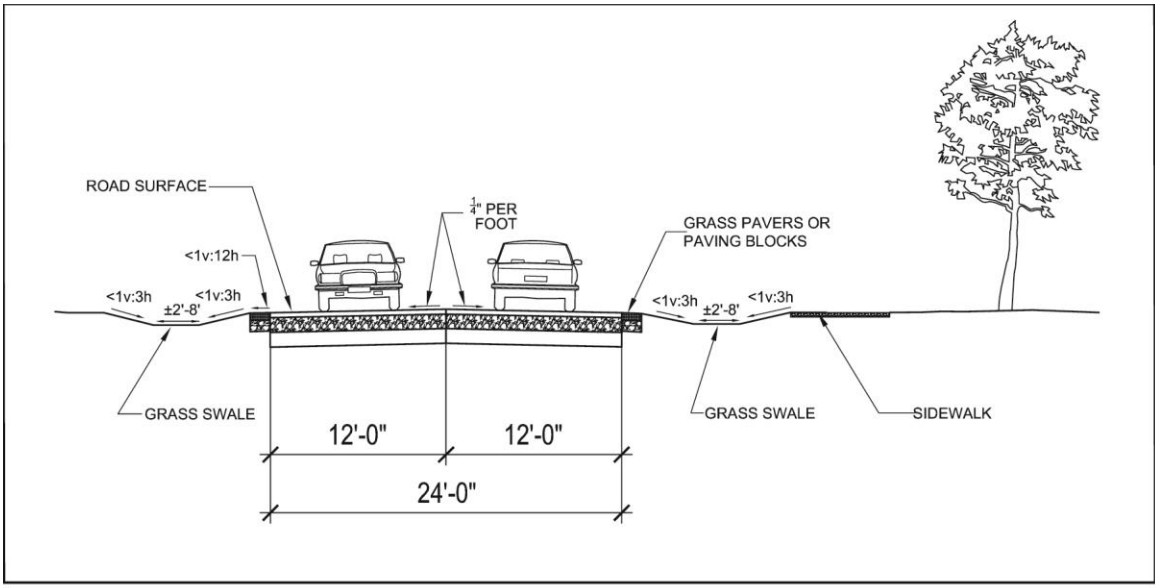

Exhibit 5-1: Typical Roadway Section

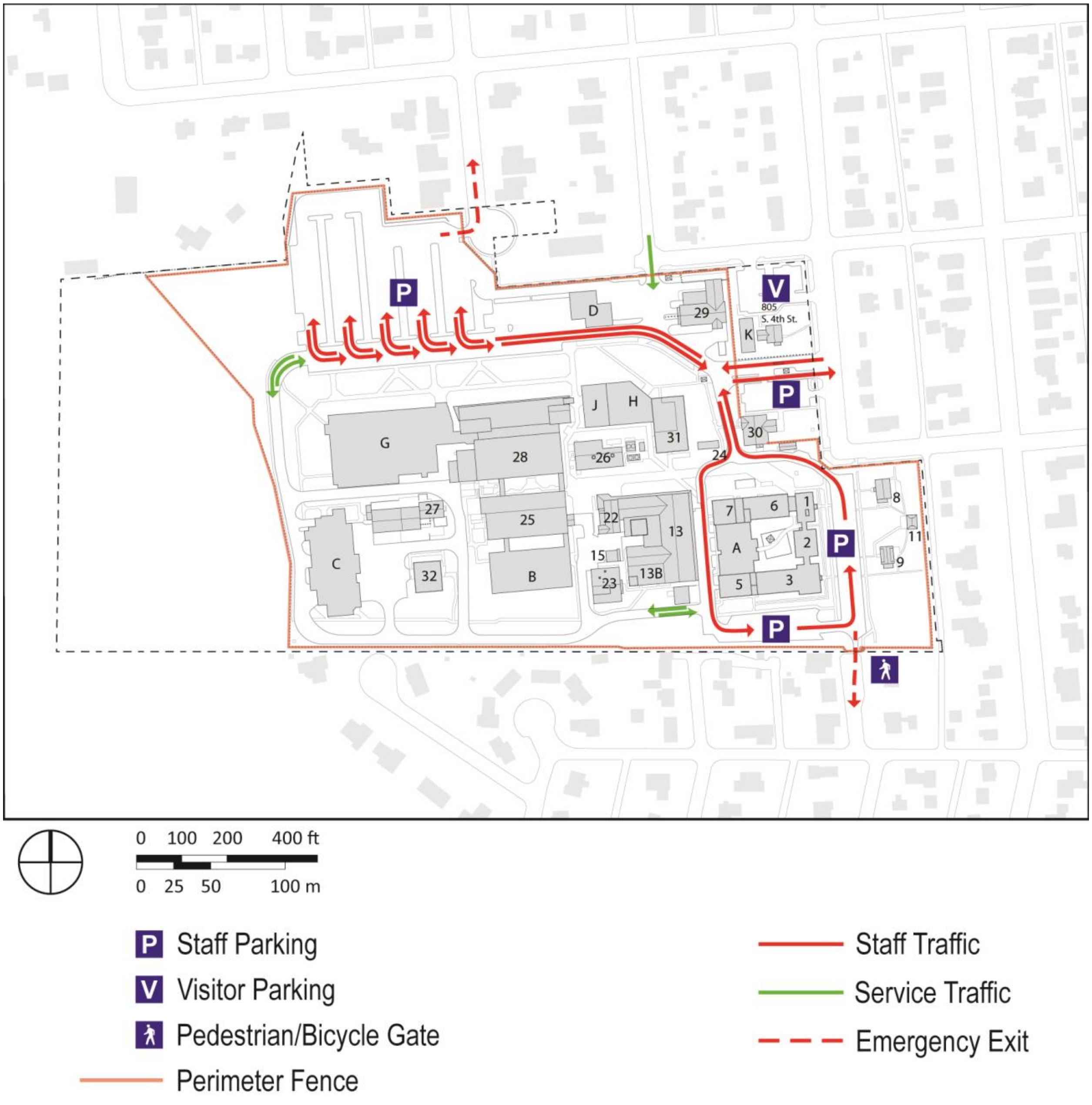

Exhibit 5-2: Access and Parking

5.4.4 Emergency Vehicle Access

Access to all campus buildings for emergency vehicles, especially fire department vehicles, must remain a priority in building, road and parking design. To facilitate this, the Pedestrian Concourse shall be designed to carry emergency vehicle traffic. Landscape elements or projecting covered walks shall not impede emergency vehicle access. The proposed emergency vehicle access routes are shown on **Exhibit 5-3**.

Exhibit 5-3: Emergency Vehicle Access

5.4.5 Pedestrian/Bicycle

5.4.5.1 Pedestrian Pathways

Pedestrian access to the site is currently limited to the staff entrance along 4th Street. Formal pedestrian pathways within the site are currently limited to the sidewalks within the Historic District. Pedestrian circulation outside of this area presently takes place without a planned system or formal pathways. The planned Central Pedestrian Concourse shall provide an internal focal point that links pedestrian access for most of the research and administrative campus buildings. Perimeter pedestrian paths are also planned to be adjacent to the loop road. It is anticipated that a system of public trails through the western portion of the site adjacent to the

Bitterroot River would be planned by the County. Access from the campus to these trails is planned from the perimeter pedestrian path.

5.4.5.2 Pedestrian Crossings

Pedestrian crossings of campus roadways should generally occur at intersection points. It is anticipated that internal, intersections will continue to operate as all direction stop intersections without any traffic lights. This intersection type will facilitate the crossing of small groups of pedestrians. All pedestrian crossings should be clearly signed and lighted, with crossing areas designated by striping, special paving or other appropriate marking devices

5.4.5.3 Bikeways

Bicycle facilities are an important element in the promotion of alternative transportation modes for employees of the RML campus to encourage healthful exercise and reduce carbon emissions. A significant amount of bicycle use occurs on the campus today. Under the Master Plan, bicycle access would be provided for employee's at all vehicular entrances and at pedestrian/bicycle employee-only gates in the perimeter fence. Bicycle access for visitors to the RML campus would be through the Visitor Center, Building 30. Access to the public trails noted above should allow for bicycle traffic as well.

In general on the RML campus it is expected that bicyclists would utilize the campus roads to circulate around the campus. However, it is important that these roadways are regularly maintained and cleared of debris, snow and ice and that drainage grates are designed flush to the surface with narrow grid openings so that bicyclists do not get trapped as with conventional parallel, widely spaced grates.

5.4.5.4 Bicycle Storage and Parking

The Green Building Council's LEED recommendation for new building construction is to provide bicycle parking/storage for five percent (5%) of the anticipated building occupancy in addition to 0.5% shower/locker facilities for the building's occupants. Any new building construction or remodeling should provide bicycle storage and show/locker facilities in accordance with the LEED requirements unless future demands require an increase amount of facility construction.

5.4.6 Accessibility

NIH has visitors and staff that have mobility, sight and hearing limitations. Accessibility features to assist these users should be incorporated in all future pathway design. Federal law requirements specified in the *GSA ABA Accessibility Standards for Federal Facilities* must be followed for new facilities. ABA standards should be followed when undertaking major sidewalk and place repairs and renovations to improve campus accessibility. In addition to the mandated requirements for new NIH pathways, the NIH shall plan the following:

- All curb ramps and blended transitions connecting to pedestrian street crossings shall have detectable warning surfaces
- Sidewalks and other pedestrian circulation paths serving new facilities and major renovations shall provide a primary pedestrian access routes and an alternate pedestrian access route to connect all new buildings to all accessible buildings and accessible parking spaces. Improvements to increase accessibility all campus facilities should be incorporated into all construction projects.

For implementation of access standards, see the ABAAS (42 U.S.C. §§ 4151 et seq**.** Architectural Barriers Act Accessibility Standard (ABAAS).

5.5 SITE PERFORMANCE GUIDELINES

5.5.1 Compliance with Codes

In accordance with 40 U.S.C. 3312 each HHS building shall be constructed or altered, to the maximum extent feasible, in compliance with one of the nationally recognized model building codes and with other nationally recognized codes including mechanical and electrical codes, fire and life safety codes, and plumbing codes. Due consideration shall be given to all State and local zoning laws as if the project were not being constructed or altered by a Federal agency[1] For this site, all work should, to the extent possible be designed and constructed under the Montana Department of Labor and Industry Building Codes Bureau http://bsd.dli.mt.gov/bc/current_codes.asp link

5.5.2 Building Character/Materials

As noted in Chapter 4, consistent architectural character is currently lacking on the RML campus. Future development on the campus should strive to reinforce the academic institutional quality of

[1] HHS Facilities Program Manual Volume I, Department of Health and Human Services May 2006

the most prominent campus buildings, the Quad and Building 28. New construction near the perimeter should also remain compatible with the scale and character of the surrounding residential neighborhood. Near the bordering residential historic district, red brick masonry should be included as a prominent exterior feature in the design of new buildings. In other locations on campus compatibility with the surrounding buildings, long term maintenance and durability should be considered when selecting the exterior material.

For long term, permanent, occupied structures; future development should exclude prefabricated buildings and exterior metal siding, as these promote an industrial impression that is contrary to the academic institutional setting noted above.

5.5.3 Landscape Design and Planting Criteria

Exhibit 5-4 shows the proposed Landscape Concepts and Planting Patterns for the RML Campus. Landscaping for the campus shall be planned and developed to enhance the basic goals of the Master Plan.

5.5.3.1 Planting Patterns and Scale

The size of trees, shrubs, and plant beds should be considered with respect to their scale relationship to the RML campus buildings, roads, and spaces. In general, plantings should be simple and conceived in broad masses. In addition, there should be a hierarchy of plantings, ranging from tree and/or shrubs along roads, entries and in parking areas, down to small garden scale plantings and floral display beds in courtyards and pedestrian gathering areas.

Plants can also serve to punctuate and reduce the scale of walls and building facades, through the use of hanging, twining, or climbing plants, which can help the buildings and spaces become part of the landscape. Similar techniques can be used for screening mechanical equipment. Flower beds should be used to soften the edges of buildings, paths, and outdoor areas. The selection of plant materials should keep security in mind as well. Plants should not provide potential intruders a means to scale perimeter barriers nor obscure security surveillance, including CCTV. Landscaping around laboratories and vivarium should be carefully designed to minimize native animal and insect populations and allow for exterminator access.

Plants selected for use on the RML campus should be of indigenous or native species, possess appropriately long-lived characteristics and have visual traits that offer refined intrinsic beauty to reflect the enduring quality of the institution. The overall design of the campus planting should be simple and seek to evoke a mood of tranquility to complement the existing natural and surrounding plantings. It is also recommended that the use of annuals and perennials be encouraged to create an uplifting campus environment for visitors and employees.

Minimizing water consumption should remain a primary concern in landscape planning for the RML Campus. Principles of xeriscaping, landscaping in ways that do not require supplemental irrigation, should be applied wherever possible. If supplemental irrigation systems are determined to be necessary for the establishment of any new planting, the installation of these systems should be temporary and, to the extent possible, utilize grey water from existing campus operations, so as not to require additional campus water consumption.

Care should be exercised in the use of ornamental plants. As a general rule, these should not be used in the more natural perimeter landscape. They should only be used in the central core areas, in enclosed courtyards and internal landscape spaces between buildings. Simple refined patterns would yield a campus that is unique, dignified, and practical to maintain.

The natural forms of plants should be retained through proper pruning techniques. This is most important when considering shrubs. Shrubs should be planted in arrangements that allow for their natural shape to be retained through periodic renewal pruning.

Adequate space must be allowed for plants to grow, particularly near paths and buildings, in order to avoid the heavy shearing of these plants which often renders them unnatural and unattractive. Planting should also be located so that they are protected from piled snow and from salt.

Tree pruning should start early in the life of campus trees to ensure that a proper form is established and that the canopy is promoted and trained to a sufficient height to provide clear visibility beneath trees for autos and pedestrians and adequate light to lawn areas.

The landscape planting for the RML Campus should provide opportunities for pollinators to thrive through the intentional design and management. Each project shall identify design strategies for creating and preserving viable foraging and nesting areas to the maximum extent feasible. The GSA *Facilities Standards for the Public Buildings Service*, "Supporting the Health of Honey Bees and Other Pollinators, addendum to Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes," can provide specificity for 1) Procedures, 2) Education, 3) Pollinator Profiles, 4) Resources, and 5) Case Studies for project specific use. This requirement is intended to promoting the health of pollinators.

5.5.3.2 Buffers and Perimeter Screening

The long term objective for improving the perimeter landscape areas should be to enhance the campus' relationship to the surrounding residential neighborhoods. Perimeter shrubs and grasses can help to mediate the uninviting qualities of perimeter fences and crash barriers required by current security standards. At the same time these plantings would provide environmental benefits including enhanced storm water management, erosion control and increased species diversity.

Any landscaping in the perimeter areas would require careful study to ensure that campus safety and security is maintained.

5.5.3.3 Special Landscape Areas and Features

Additional attention should be given to the landscape character in critical campus areas, based on the following recommendations.

- **Central Pedestrian Concourse:** Utility lines run beneath the concourse area. Planting in this area should be limited to native species with shallow root structures that would not threaten existing utility lines and that could be readily replaced if removed for maintenance purposes. Paving should be patterned to emphasize the pedestrian character of the concourse. Paving should also be designed to allow service and emergency vehicle access. Where practical, paving should be designed to permit access to utility lines for maintenance.
- **Historic Core:** Existing planting, particularly old growth trees, shall be retained and protected within the historic district. As these plants die they should be replaced in kind, unless disease is suspected, in which case similar, disease resistant species should be used in replacement. New landscaping in this area should reinforce existing landscape patterns, including the allee of trees lining the extension of 4th Street, the entry plantings at Buildings 1, 2 and 3 and the lawn area defined between Buildings 8, 9 and 11.
- **Interpretive Center:** The existing landscaping, particularly old growth trees, of the 805 South 4th Steet property should be retained. Formal planting as well as paving should be added to present a welcoming appearance and guide visitors from the parking to the Interpretive Center entrance. Landscaped links should also be provided between the log cabin and the Interpretive Center building.
- **Landscape Screening:** Landscape screening should be added between the parking area and 4th and Baker Streets.
- **Site Entry:** The existing old growth trees in front of the Visitors Center (Building 30) shall be retained and protected. Formal plant beds should be developed for the area between the Visitors Center and 4th Street. Landscape screening should be added around the water pumping structure adjacent to the Center.
- **Floodplain Trail:** The floodplain is generally defined by existing wetlands. Landscaping in the wetlands area is generally discouraged. The Master Plan recommends an RML trail link to a public trail system, should one be developed.

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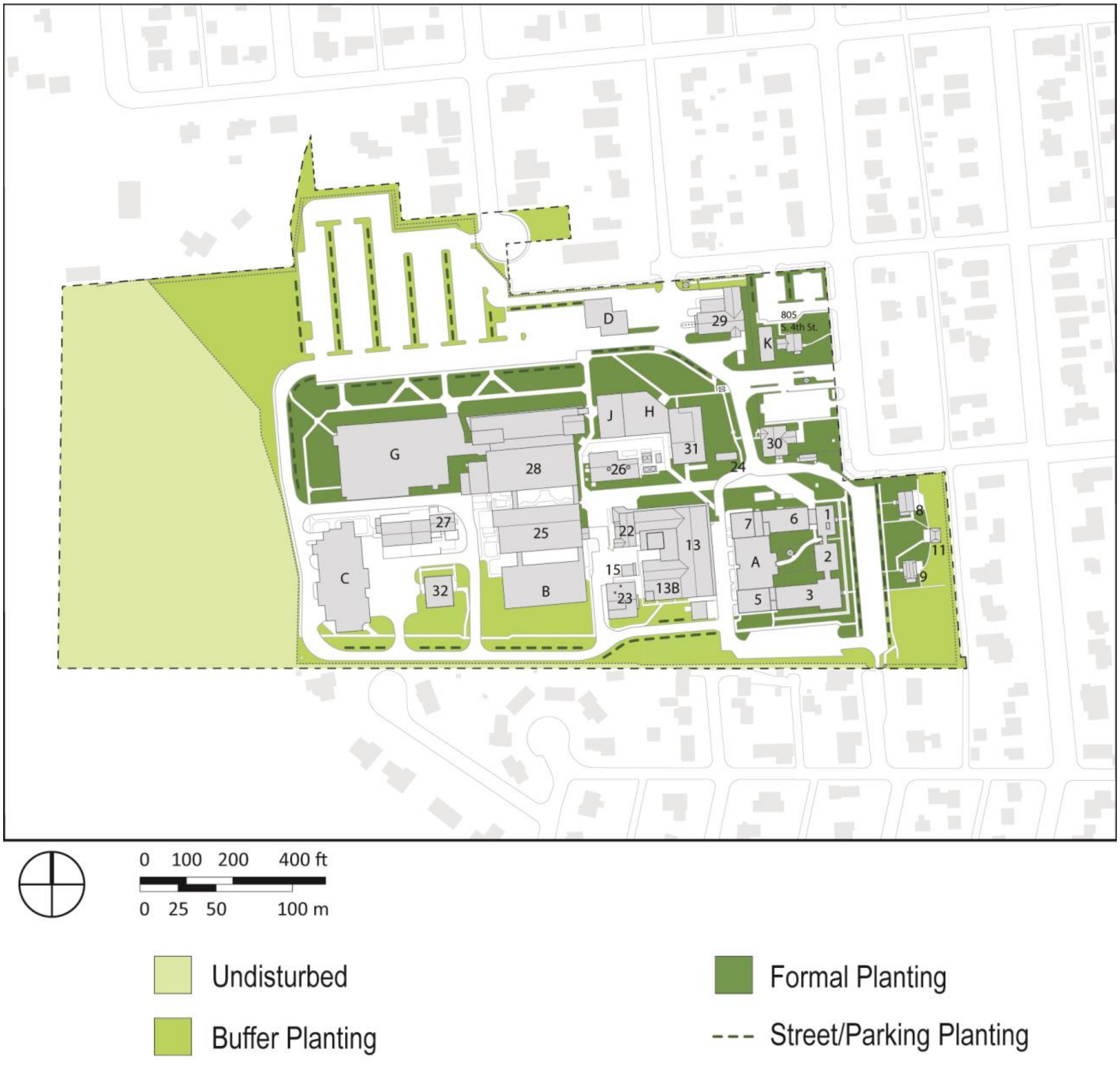

Exhibit 5-4: Campus Planting Patterns

5.5.4 Streetscape/ Pathscape

5.5.4.1 Street Tree Recommendations

The primary planting objective for the loop road system should be to create a uniform appearance that assists in defining the road as a continuous corridor. This should be done through the use of uniform tree types and regular spacing. As a general rule, the Master Plan recommends the use of large deciduous trees along the loop road in order to form a continuous canopy that will provide foliage at a height from 10 to 15 feet above the ground allowing open views below the branches. Trees along the loop road should be selected from those recommended by the City of Hamilton.

5.5.4.2 Detailed Streetscape Layout Recommendations

Roadways should be bounded by swales designed to capture and filter surface runoff in keeping with the Low Impact Development practices. There should be occasional paved areas for access to the street. Streetlight posts and roadway regulatory and directional signage should be accommodated outside of the swales.

Pedestrian walkways, located adjacent to the planting strips, should be at least six feet wide to accommodate service vehicles if needed. Paths and walkways should generally be constructed of concrete. Special paving patterns and materials should be used to highlight key areas such as the Pedestrian Concourse and major building entrances. These areas should also include seating areas, solid waste and recycling receptacles, pedestrian lighting, landscaping and above grade planters. The Master Plan recommends using a standardized paving material throughout the campus to facilitate maintenance and enhance campus coherence.

Currently site furnishings on campus are not well coordinated either by style or location. The Master Plan recommends adopting a standard palette of street furniture including seating, receptacles, bicycle racks, and kiosks, which are functional, easily maintained, and aesthetically compatible for use throughout the campus. The use of durable and natural materials for site furnishings is encouraged. These elements will not only provide pedestrian scale and comfort, but also visually unify the campus environment.

5.5.5 Exterior Signage

Most buildings on the RML campus are identified by a sign bearing their building number. Beyond this the campus lacks consistent signage for information and wayfinding. A comprehensive signage and wayfinding plan should be developed for the campus, including recommendations for the upgrade or replacement of the existing signage system according to sign type, location, graphic quality, physical condition and maintenance, accuracy of information and adequacy of the amount of signage. The categories of signage which should be addressed include the following:

- Orientation - site maps near the campus entry and area maps in the core of the campus.
- Directional – signage to major campus buildings and areas, both for vehicles and pedestrians. Notations of accessible routes for persons with disabilities.
- Identification - campus entry signage and exterior building and place signage. Regulatory/Safety, traffic and parking control, safety, and warning signage. Information - public announcements, etc.
- Interpretive - campus tour signage, plant species signage, etc.

Visitor and staff entries should be clearly and coherently signed to both identify the RML campus and create a positive first impression of the institution. Along the loop road, signage should be consistent and serve as a clear orientation tool. Directional kiosks bearing a campus map should be included at key pedestrian locations. Signage characters should be clearly legible and should be of a quality appropriate to a world renowned institution. There should be design consistency between all campus sign types. Signage placement should also be carefully considered to avoid visual clutter. Regulatory and traffic signage should be consolidated to the greatest extent possible and reviewed to determine if more compatible designs can be implemented rather than the standard uniform roadway signs which are now used.

5.5.6 Exterior Lighting

The campus lacks a coordinated lighting scheme within a single family of lighting fixtures. Site lighting on the campus is mostly limited to the Historic District at the south end and at site entry points. Building lighting, where it exists, is generally limited to utility fixtures. A consistent, comprehensive lighting scheme should be developed for the campus, including recommendations for fixture type, location, and light quality. All general campus lighting (at the loop road, major pedestrian framework, primary entries, etc.) should be of a single fixture type. Individual building projects may continue to differentiate fixture types for buildings and surrounding area lighting, within a style complementary to other campus lighting. Consideration should be given to including solar powered fixtures or other low energy consumption, and long life fixtures (i.e. LED) where practical.

Categories of lighting which should be addressed include the following.

- Street - for vehicular safety and general campus illumination- The NIH Design Policy and Guidelines specifies a level of 50 lux, or 2-5 foot candles for roadways
- Pedestrian - for pedestrian safety and path marking- The NIH Design Policy and Guidelines specifies a level of 10 lux, or 1-2 foot candles for pedestrian areas.

- Building - to identify building entries and provide security.
- Safety/Security - for areas of the campus that pose danger or require surveillance.
- Signage - at major entry locations and for key directional and orientation signage.
- Special Features – for building or landscape highlighting at special outdoor spaces or monuments.

Exhibit 5-5 illustrates the primary Master Plan lighting concept recommendations. Loop road lighting should be of a distinct character to help define the road as a continuous vehicular corridor. Parking area lighting must conform to security requirements. Lighting for the Central Pedestrian Concourse should enhance the significance of this area as a principal circulation and gathering space. Lower intensity pedestrian lighting should be provided for secondary pedestrian routes. Parking areas must be lighted in accordance with security requirements.

At the campus perimeter special attention should be given to avoiding spillover lighting into adjacent neighborhoods. Full-cutoff light fixtures, which allow no light to be emitted above a designated horizontal plane, should be used for roadways, walkways, parking, and buildings. Increased landscape screening should also be considered where practical.

Fixture lamps should be selected for energy savings, light quality, and maintenance characteristics. Mercury vapor lamps are discouraged. Additionally, it should be recognized that simply increasing or decreasing lamp wattage is not always the correct solution to a perceived lighting problem. Other factors such as light direction, light quality, surface reflectance, and contrast with surrounding areas can affect perceptions of security and character.

5.5.7 Street Furniture

Well-designed street furniture makes the sidewalk realm more comfortable and life on the campus more convenient. Benches provide places to rest, read, have informal discussions, or have lunch. Properly distributed trash receptacles help to keep the campus clean. In addition to providing amenities, street furniture can also provide a buffer from the noise and commotion of vehicles in the street. Site furnishings on campus shall be coordinated by style and location. The Master Plan recommends that street furniture be organized in a way that maximizes safety, comfort, and function for all users. In addition to location considerations, the design of street furniture should be simple and compatible with the existing built environment.

Seating, receptacles, bollards and bicycle racks should be functional, easily maintained, and aesthetically compatible throughout the campus. The use of durable materials for site furnishings is encouraged. These elements will not only provide pedestrian scale and comfort, but also visually unify the campus environment. Special emphasis should be given to increasing seating areas through the use of low seat-walls, picnic tables, and benches throughout the campus, in order to improve the quality and location of outdoor places for eating and relaxation within the grounds of the campus.

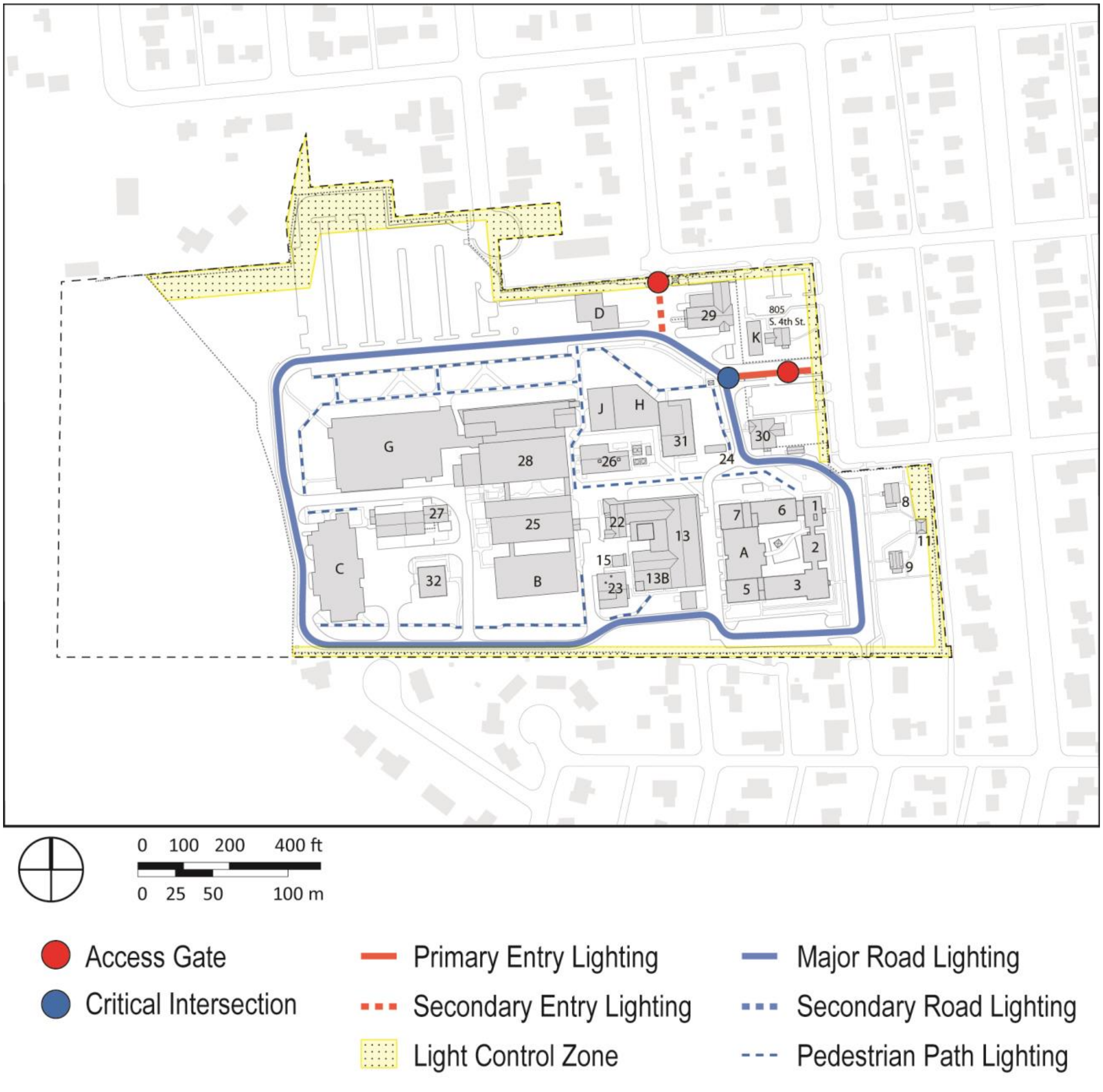

Exhibit 5-5: Lighting Concept Plan

5.5.7.1 Outdoor Seating

There are many types of exterior seating available. These include outdoor tables, chairs, benches, seating walls, steps, planters, and raised tree beds. The design and location of seating should respond to how their surrounding space is used. Seating should be provided in areas where people are likely to congregate. Additionally, streets with significant pedestrian traffic should have frequent opportunities to sit, rest, and wait.

The best location for seating is a protected location (i.e. beneath a street tree or overhang) that does not interfere with the pedestrian flow. Care should be used when placing benches to ensure they do not interfere with entrances to buildings, heavily used loading zones, parked vehicles, access to fire hydrants, snow removal and other potential conflicts. Seating should be provided for a minimum of two people. Single seats may be provided as long as they are in groups of 2 or more. Seating can be integrated into buildings and street walls. Seating should be constructed of a durable material and should integrate aesthetically with the surrounding architecture and street furniture.

5.5.7.2 Bicycle Racks

Bicycle racks should be installed as part of all construction projects that bring new employees to the RML campus. At a minimum, the racks should accommodate bikes for five percent (5%) of the building population (GSA Facilities Standards P-100, LEED recommended standard).

Racks should be located near the main and secondary entries to a building. A minimum clearance of 5'-0" should be maintained between the nearest element of an unoccupied bicycle rack and any adjacent street furniture, light poles, curb cuts or building entries. Racks should not be installed so parked bicycles obstruct the pedestrian flow as well as not obstruct access to fire hydrants.

Good bicycle parking designs maximize capacity, maintain an orderly appearance, are secure, and are simple to use. Some bicycle rack designs that are available commercially do not meet these criteria, and therefore should not be used on the NIH campuses. Bicycle racks should be constructed of a durable material and should integrate aesthetically with the surrounding architecture and street furniture.

Approved bicycle rack designs must meet the following criteria:

- The rack should support the frame of the bicycle at two points
- The rack should support different bicycle frame sizes and styles
- The rack should be simple and easy to use
- The rack should allow easy locking of the frame at least one and preferably both wheels

5.5.8 Noise Control

Campus Noise Level Criteria Standards were developed for RML in 2003. Based on these standards the noise levels at the property line of the RML site are to be maintained at or below 55 decibels adjusted (dBA) during the day and at or below 50 dBA at night). RML is in the process of bringing existing campus activities into compliance with these standards. All new projects undertaken under the Master Plan are required to comply with these standards. Noise levels in the vicinity of new campus projects should be measured prior to the start of work to establish a baseline condition. Compliance should be demonstrated during the design phase through modeling and prediction of noise levels. Following completion of construction work, noise should be measured again to determine if noise levels are within the predicted range. If noise outside the campus exceeds pre-construction levels, mitigation measures should be implemented to lower noise to the pre-construction level. Where possible, the potential for new construction projects to reduce or contain existing campus noise should be explored. Mitigation of noise levels during construction should be managed through strict control of construction work hours and by continuing processes, already in place on the campus, to communicate with the community on those occasions when construction activities may generate excessive noise.

5.5.9 Environmental Sustainability Planning

In support of the National Institutes of Health's mission to apply knowledge to "extend healthy life", the Master Plan for the RML Campus seeks to create a healthy human environment that is restorative to the health of the natural world. The Master Plan goes beyond the minimum standard of limiting the impacts on the site and the environment and seeks to create a sustainable campus. The NIH RML Master Plan Update integrates HHS sustainability policies. These policies include Federal sustainability regulations:

- 2014 The HHS Sustainable Buildings Plan
- the HHS Strategic Sustainability Performance Plan
- Executive Order 13653, Preparing the United States for the Impacts of Climate Change
- Executive Order 13690, Federal Flood Risk Management Standard
- Executive Order 13693, Planning for Federal Sustainability in the Next Decade

These regulations continue to evolve and may change in the future. Each future project would be designed to meet the sustainability regulations in place at that time. Each new building and construction project should be coordinated closely with the NIH ORF Division of Environmental Protection Sustainability Branch.

5.5.9.1 The Guiding Principles

The 2006 Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding "Guiding Principles" are included in the "NIH Design Requirements Manual". They are:

- Employ Integrated Design Principles
- Optimize Energy Performance

- Protect and Conserve Water
- Enhance Indoor Environmental Quality
- Reduce Environmental Impact of Materials

Refer to the “NIH Design Requirements Manual”, Section 1-10: “Sustainable Design” for further guidance.

5.5.9.2 The HHS Strategic Sustainability Performance Plan and the HHS Sustainable Buildings Plan (2014)

The HHS Strategic Sustainability Performance Plan (SSPP) is the framework for the Department’s overall sustainability program. The HHS Sustainable Buildings Plan (SBP) is a collection of policy, procedures, guidance and tools designed to summarize and record the Department’s program to incorporate sustainable measures into building assets. The SBP supplements the HHS SSPP.

5.5.9.3 New Construction and Major Renovation

All construction projects and major renovation projects shall incorporate the “Guiding Principles” into their planning, design, construction, operation, maintenance, and decommissioning processes. Construction projects under the scope of this policy, which have a total project cost equal to or greater than $10 million, shall also obtain a third party certification that meets the requirements of a multi-attribute green building standard or rating system developed by an ANSI-accredited organization. HHS defines major renovation projects as improvement projects, which have a total project cost equal to or greater than $10 million and/or impacting 40 percent or more of the overall floor area. All major renovation projects shall obtain a third party certification that meets the requirements of a multi-attribute green building standard or rating system developed by an ANSI-accredited organization.

EO 13693 specifies that each agency improve building efficiency, performance, and management by: ensuring, beginning in fiscal year 2020 and thereafter, that all new construction of Federal buildings greater than 5,000 gross square feet that enters the planning process is designed to achieve energy net-zero and, where feasible, water or waste net-zero by fiscal year 2030. A zero-net energy building is defined as “a building that is designed, constructed and operated to require a greatly reduced quantity of energy to operate, meet the balance of energy needs from sources of energy that do not produce greenhouse gases, and therefore result in no net emissions of greenhouse gases while being economically viable.” In the RML Master Plan Update all projects in Phase 2 and later should be designed to meet this target. Additionally, Per EO EO13693, HHS is required to ensuring that all new construction, major renovation, repair, and alteration of agency buildings includes appropriate design and deployment of fleet charging infrastructure.

Site development and planning for construction projects and major renovations shall be in accordance with “Technical Guidance on Implementing the Storm Water Runoff Requirements for Federal Projects” under Section 438 of the “Energy Independence and Security Act”, EPA document number EPA 841-B-09-001, dated December 2009. The document was developed in conjunction with other federal agencies and provides a step-by-step framework that will help federal agencies maintain pre-development site hydrology by retaining rainfall on-site through infiltration, evaporation/transpiration, and re-use to the same extent as occurred prior to development.

5.5.9.4 Existing Buildings

All existing buildings shall be assessed for compliance with the Guiding Principles to ensure that HHS is moving towards 100% compliance. At least 15% of the applicable HHS building inventory, owned and direct leases over 5,000 gross square feet, must incorporate the sustainable buildings practices in the Guiding Principles by FY 2015. All improvement, repair and maintenance projects in existing buildings shall incorporate the Guiding Principles to the maximum extent feasible.

NIH shall ensure that rehabilitation of federally owned historic buildings utilizes best practices and technologies to promote long-term viability. Rehabilitation work shall be in accordance with “HHS Program Manual Volume-I”, Section 3-3. EO 13287 Preserve America and Section 110 of the National Historic Preservation Act (NHPA). In addition, HHS policy provides guidance on real property disposal (HHS Facilities Program Manual, Volume 2, Section 5-1), which includes adaptive reuse and the evaluation of disposal properties for HHS reuse.[2]

5.5.9.5 Sustainability - Water

EO 13693 mandates an improvement in agency water use efficiency and management, including storm water management by: reducing agency potable water consumption intensity by 36 percent by fiscal year 2025 through reductions of 2 percent annually through fiscal year 2025 relative to a baseline of the agency's water consumption in fiscal year 2007; installing water meters and collecting and utilizing building and facility water balance data to improve water conservation and management; reducing agency industrial, landscaping, and agricultural (ILA) water consumption by 2 percent annually through fiscal year 2025 relative to a baseline of the agency's ILA water consumption in fiscal year 2010; and; installing appropriate green infrastructure features on federally owned property to help with storm water and wastewater management. Since the plan is agency wide, there is no specific plan for RML or any campus site individually, to comply with EO13693 but all practical water

[2] Department of Health and Human Services (HHS) Sustainable Buildings Plan, 2014

conservation methods should be employed in new construction and existing facilities as funds become available.

Water efficiency strategies outlined in the "Labs21 Environmental Performance Criteria" (see section 5.5.9.7.3) address implementation of strategies associated with laboratory equipment and processes. Recommended strategies include use of closed-loop cooling systems, reuse of treated process wastewater, non-potable water sources in feasible operations, using floor-wash machines instead of hosing, substituting vacuum pumps instead of aspirator fittings, and modifying SOPs to reduce water use where feasible. These sustainable features would yield savings in water consumption. These recommendations can be utilized as the foundation of sustainable design in laboratories and may be useful in extension to animal care facilities.

Water intensive operations within animal facilities are due to a variety of equipment utilized in animal husbandry and experimentation. Water consumptive equipment in the animal facilities are cage-rack tunnel washers, rack-washers, reverse osmosis (RO) water purification systems, automatic water systems and bottle fillers, autoclaves, clothes washers, and showers for personnel.

Although the largest conservation gains may be realized within laboratory and animal facilities, water saving features may be implemented in other facility types to reduce the overall consumption. RML was audited for water efficiency in 2003, and efficiency measures were installed in 2004/5 timeframe. Approximately 12 urinals were retrofitted with 1.5 gal/flush valves, and 48 toilets were retrofitted with 1.6 gal/flush fixtures. The savings at the time was estimated at 876,000 gallons/year. There are not any current plans for additional projects but there will continue to be audits at RML seeking cost effective opportunities to reach, and potentially exceed, the mandated water conservation goals.

5.5.9.5.1 Water Conservation

The following is a list of specific water conservation features that shall be considered, among others, to achieve the mandatory 30% reduction in water use, per the Guiding Principles.

- Reuse of cage-wash water
- Use of grey-water
- Low-flow and/or self-closing faucets
- Low-flow toilets
- Low-flow urinals

5.5.9.5.2 Storm water Management: Erosion and Sediment Control

Storm water Best Management Practices (BMPs) that can effectively slow the rate of runoff from the campus while removing pollutants from surface drainage should be incorporated into campus development. BMPs such as grassed swales, filter strips adjacent to new parking areas, porous pavement, and infiltration trenches in areas of concentrated runoff have been shown to be effective in improving water quality if properly maintained. RML should regularly inspect and maintain its future BMPs to ensure their long-term effectiveness. In addition, all new development projects on the campus should include erosion and sediment control plans designed to minimize erosion and release of unfiltered runoff from the site and into adjacent waterways. Low Impact Development (LID) principles should also be incorporated into campus development. LID is a design strategy that uses natural and engineered infiltration and storage techniques to control storm water. Examples of LID technologies include; engineered filtration systems such as bio-retention cells, infiltration trenches, and sumps; low tech use of native vegetation for rain gardens and bio-swales; reducing impervious surface areas recycled materials such as porous concrete or permeable pavers; and infrastructure improvement such as curbless and gutterless roadways.

5.5.9.5.3 Storm water Management: Conservation

The following is a list of specific storm water management conservation features which shall be considered in the design phase for all buildings and be implemented during the construction phase of the RML Master Plan Update.

- Collection and use of rooftop rainwater runoff for sanitary uses or landscape irrigation
- Bio swales for storm water conveyance
- Bio retention
- Filter strips in the central green spaces
- Tree-box filters

5.5.9.6 Sustainability - Energy

Energy conservation in Federal buildings is mandated by EO 13693 which sets targets for per year energy use reduction, clean energy use and renewable energy use for the agency. Since the plan is agency wide, there is no specific plan for RML or any campus site individually, to comply with EO13693 but all practical energy conservation methods should be employed in new construction and existing facilities as funds become available. NIH continues to work to identify clean energy and renewable energy projects that can be implemented cost effectively.

EO13693 states that, where life-cycle cost-effective, beginning in fiscal year 2016, promote building energy conservation, efficiency, and management by reducing agency building energy intensity by 2.5 percent annually through the end of fiscal year 2025 by: implementing efficiency measures, improving data center energy efficiency, ensure that the percentage of the total amount of building electric energy and thermal energy consumed shall be clean energy is not less than 10 percent in fiscal years 2016 and 2017and increasing (as indicated in the EO) until it is not less than 25 percent by fiscal year 2025 (and each year thereafter) and ensure that the percentage of the total amount of building electric energy consumed by the agency that is renewable electric energy is not less than 10 percent in fiscal years 2016 and 2017 and increases (as specified in the EO) until fiscal year 2025 (and each year thereafter) when it is not less than 30 percent.

Methods of contributing to these agency-wide goal on the RML campus could include installing agency-funded renewable energy, thermal renewable energy, combined heat and power processes, fuel cell energy systems or other renewable energy technologies on site. One method NIH continues to employ is Energy Saving Performance Contracts. There is a current Energy Savings Performance Contract ongoing at RML. It is part of a broader initiative across all NIH real property. The RML project includes installation of a summer boiler, utility metering, and upgrading meter data systems. There are not any current plans for additional projects but there will continue to be audits at RML seeking cost effective ESPC opportunities.

The Master Plan promotes energy efficiency and savings within buildings through site layout strategies. For many buildings within the Master Plan, the dominant building orientation has the long axis running east to west. This orientation provides the greatest opportunities for energy efficient building design. Glazing on the long north side is ideal for day-lighting with little summer heat gain. The corresponding glazing on the south can be easily shaded from the high mid-day summer sun to limit heat gain, but can allow penetration into the building of lower winter sun to gain desired heat during that time of year. The short building elevations are to the east and west where low-angle morning and afternoon sun have less day-lighting potential because of uncomfortable glare that causes blinds to be used to block daylight.

Using a combination of the following strategies, in addition to others that may be available at the time of design and construction, can provide increased building energy efficiencies:

- Day-lighting
- Lighting control systems (i.e., photo sensing devices, occupancy sensors)
- Reflective white or light-colored or planted green roof systems
- Heat Recovery (e.g. heat wheel, heat pipe)
- Energy monitoring and control system (EMCS) with direct digital control (DDC)
- On-site energy generation (e.g., photovoltaic panels, solar water heating)

5.5.9.7 Sustainability - Building Rating Systems

The main goals of sustainable building design and operation are to:

- Maximize the potential of the site

- Minimize the energy and resource consumption
- Protect and conserve water
- Use environmentally preferable products and materials
- Enhance indoor environmental quality
- Optimize operational and maintenance practices

Either LEED or Green Globes certification is encouraged to achieve these goals. The two programs differ in the sustainable features emphasized. LEED certification designs place more emphasis on the innovation of sustainable sites, the use of sustainable materials and resources. For certification according to LEED 2009 (v3), at least 40 points out of 100 must be obtained for the lowest certification level. The Green Globes certification emphasizes reduction of energy use, project management, and emissions. Certification is based on the points earned for each sustainability category on a sliding scale up to 1,000 points. Certification through either system can be used to achieve the goals mandated by the current regulation.

5.5.9.7.1 LEED Green Building Rating System

Designed by the US Green Building Council, the LEED Green Building Rating System is a voluntary, consensus-based, international standard for developing high-performance, sustainable buildings and has been adopted by many federal agencies as a means of achieving some of the goals of current environmental EOs. LEED was created to define green building by establishing a common standard of measurement while promoting environmental, economic, health and community benefits. LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, Co2 emissions reduction, stewardship of resources, and indoor environmental quality all based on a 100-point rating scale. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources (USGBC, 2008).

The RML Master Plan Update anticipates that the construction of new buildings and infrastructure would meet or exceed the standards represented by the level of certification applicable at the time of design and construction within the LEED Green Building Rating System. New construction would be executed sequentially in phases, each with a component of site work and infrastructure. The Master Plan design sets up a framework that would allow new buildings to achieve a number of the credits necessary for LEED certification. In some cases, the strategies employed would be used for individual buildings sequentially. In other cases, the site is treated as a whole under the guidance of the “LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects.” Credits that could be earned under this Application Guide are noted below. Components of the Master Plan could qualify for the following credits within the Sustainable Sites, Water Efficiency and Innovation in Design sections. Other credits under the LEED rating program are building specific and, therefore, each building must independently meet the requirements of those credits.

5.5.9.7.1.1 Sustainable Sites

- Credit SS 1 - Site Selection: All the new facilities proposed in the RML Master Plan Update would redevelop an existing site. This credit can be achieved because reuse of the existing campus promotes the preservation of green-fields and green spaces elsewhere and is an efficient way to reuse the land resources of the NIH. (1 point)
- Credit 4.3 - Alternative Transportation, Low Emitting and Fuel Efficient Vehicles: Preferred parking for low-emitting vehicles could be provided within the parking lots should the NIH elect to provide this option to its employees or within its motor pool. Additionally, Per EO EO13693, HHS is required to ensuring that all new construction, major renovation, repair, and alteration of agency buildings includes appropriate design and deployment of fleet charging infrastructure (3 points)
- Credit 4.4 - Alternative Transportation, Parking Capacity: five percent (5%) of parking on the RML campus could be designated preferred parking[1] for carpools or vanpools. (2 points)
- Credit 5.1 - Site Development, Protect or Restore Habitat: The Master Plan meets this by recommending that as the entire site (LEED NC minimum is 50% excluding the building footprint, 20% including the building footprint) will be planted with native or adapted vegetation. (1 point)
- Credit 6.1 – Storm Water Management, Quantity Control: The Master Plan outlines a strategy for treating the two-year storm on-site through a combination of Best Management Practices. (1 point)
- Credit 6.2 – Storm Water Management, Quality Control: By treating the two-year storm, more than 90% of the average annual rainfall would be treated on-site. (1 point)
- Credit 8 – Light Pollution Reduction: Low, cut-off fixtures and setbacks from property lines would keep night-time illumination focused on the ground and within the site boundaries. (1 point)

5.5.9.7.1.2 Water Efficiency

- Credit 1– Water Efficient Landscaping: This credit can be met because no new irrigation is planned, other than to establish new plantings. (2-4 points)
- Credit 2 – Innovative Wastewater Technologies: Water conserving urinals and dual-flush toilets can reduce potable water use for building sewage conveyance by 30 - 50% relative to the baseline FEMP compliant building. (2 points)

- Credit 3 – Water Use Reduction, 30%-40% Reduction: Low-flow fixtures and water reuse strategies could reduce water use by more than 40% relative to the baseline FEMP-compliant building. (2-4 points)

5.5.9.7.1.3 LEED Certification

Basic LEED Certification requires that 40 credits be earned. As outlined above, through implementation of the Master Plan, buildings seeking certification could start with 27 to 31 of the 40 required for certification.

Note that this analysis of LEED Certification is based on LEED for New Construction – Version 3, 2009, the version of the LEED Green Building Rating System in effect at the time of the drafting of the Master Plan. Future buildings designed for the RML Campus would meet or exceed the applicable sustainability regulations in place at that time.

5.5.9.7.2 Green Globes

The Green Building Initiative (GBI) created the Green Globes rating system which is utilized by many federal agencies as a means of achieving some of the goals of EO 13693.

The GBI promotes building practices that emphasize energy efficiency, healthier and environmentally sustainable buildings in residential and commercial construction. This program offers opportunities for recognition and certification in design, construction and/ or operation of the building. Green Globes assesses areas in energy, indoor environment, site, water, resources, emissions, and project/ environmental management.

5.5.9.7.3 Labs21

LEED and Green Globes do not have specifications directly addressing laboratory buildings or animal facilities. “Labs for the 21st Century” (Labs21) was created as a partnership between the US Environmental Protection Agency, the US Department of Energy, and the International Institute for Sustainable Laboratories that seeks to improve energy efficiency and environmental performance of the nation’s labs on a voluntary basis (Labs21, 2008). This program bridges the gap in current implementation strategies (i.e., Green Globes, LEED) for sustainable design associated with laboratories. According to Labs21, laboratory-type facilities represent an important segment of the national building stock, especially when considered in terms of energy intensity and overall consumption. Energy intensities in laboratories are often five-times higher than those found in ordinary (non-laboratory) buildings, such as offices. In the case of clean rooms (including bio containment laboratories), intensities are 10-100 times higher, depending on classification. Implementation of sustainable strategies in the design and operation of laboratories can provide an overall energy savings potential of 50%.

Designers of laboratory buildings and renovations on the NIH RML Campus should utilize the Labs21 Environmental Performance Criteria system as a means to design and evaluate the performance of sustainable laboratory buildings. Labs21 incorporates and encourages the utilization of multiple sustainable design considerations, but focuses primarily on energy efficiency improvements.

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APPENDIX A. FREEZE AND REDUCE THE FOOTPRINT

1 FREEZE THE FOOTPRINT

On May 11, 2012, the Office of Management and Budget (OMB) introduced a "Freeze the Footprint" (FTF) policy in section 3 of OMB Memo 12-12 (M-12-12). On March 14, 2013, OMB issued new guidance, "Management Procedures Memorandum No. 2013-02," requiring all civilian executive branch agencies to maintain a static balance in their directly leased, owned, and GSA-assigned buildings' inventory of office and warehouse space as compared to the FY 2012 baseline provided by GSA. This means any increases to office or warehouse type space must be offset with a corresponding square footage (SF) decrease in space so the HHS as a whole does not exceed the FY 2012 baseline in any fiscal year.

The baseline used for FTF measurement and evaluation purposes is a combined total for FY 2012 of the office and warehouse SF that HHS reports to GSA's FRPP and HHS's office and warehouse SF located in GSA-assigned space. The GSA assignments baseline data is provided by GSA. HHS manages, and tracks the annual SF balance of all HHS agencies' office and warehouse SF, and ensures a zero net increase to the Department's overall inventory of such space during a given fiscal year compared to the baseline.

2 REDUCE THE FOOTPRINT

On March 25, 2015, OMB released the National Strategy for Real Property and the companion Reduce the Footprint (RTF) policy.

The National Strategy is a three-step framework to improve real property management by freezing the growth in the inventory, measuring performance to identify opportunities for efficiency improvements, and reducing the size of the inventory by prioritizing actions to consolidate, co-locate, and dispose of properties.

This policy requires agencies to (1) set annual square foot reduction targets for federal domestic buildings; (2) adopt space design standards to optimize federal domestic office space usage; and (3) maintain their FY 2015 FTF baselines.

Agencies are accountable for maintaining their FY 2012 office and warehouse baselines through FY 2015. At the end of FY 2015, the FY 2012 baseline established by the FTF policy will expire. A new office and warehouse baseline, required by the Reduce the Footprint policy, will be set with FY 2015 data. The Reduce the Footprint (RTF) policy requires that agencies set annual reduction targets for all building types and requires that agencies, at a minimum do not exceed their FY 2015 baseline, which is still called the “Freeze the Footprint” baseline.

3 IMPACT OF PROPOSED 2015 RML MASTER PLAN UPDATE OF FTF AND RTF POLICIES

Since Freeze the Footprint and Reduce the Footprint policies are measured on an Agency level, HHS has the flexibility to allow growth in some parts of the real property portfolio if offsets can be obtained in another area of the portfolio. Master Plans provide a framework and projection of possible reduction and growth on each of the HSS campuses but these projections are unfunded. **Exhibit A-1** lists development of the NIH RML campus by each proposed phase of the Master Plan.

It should be noted that not all existing structures cataloged in the 2015 RML Master Plan Update were determined to be reportable per federal real property guidance. The structures that are not reported are temporary, removable structures leased as equipment. These structures include RML SS-2, RML SS-3, RML SS-4, RML T25 and CONEX 1.

Exhibit A-1shows all the Predominant Use Catagories of Reportable Buildings on the RML campus and highlights the Office and Warehouse catagories which are the focus of the Freeze and Reduce the Footprint policies. In Phase 1 and Phase 2 there is a reduction in the Office and Warehouse catagories which provides the needed offset for the proposed office growth in Phase 3. Phase 4 has no proposed change in either category.

It is important to note that the offset need for proposed office growth is provided by a change of use in ARMO 1 and Building 22. These changes of use are not allowed to be taken as offsets until the building is demolished. ARMCO 1 is demolished in Phase 4 so HHS would need to provide an offset in another area of the HHS portfolio until Phase 4 is implemented. It would not be a prudent use of government resources to demolish Building 22 which is in good condition. If HHS is not able to identify an offset for Building 22, the size of proposed Building J may need to be reduced in Phase 3.

Exhibit A-1: Predominant Use Category of Reportable Buildings (GSF)

Phase	Building	Industrial	Laboratories	Museum	Office	Other Institutional Uses	Service	Warehouse
Existing (2014)	804 South 4th St.			1,867				
Existing (2014)	RML-01		8,246					
Existing (2014)	RML-02		9,468					
Existing (2014)	RML-03		24,814					
Existing (2014)	RML-05		7,224					
Existing (2014)	RML-06		15,000					
Existing (2014)	RML-07	3,975						
Existing (2014)	RML-08				4,461			
Existing (2014)	RML-09				3,156			
Existing (2014)	RML-11				660			
Existing (2014)	RML-12		7,690					
Existing (2014)	RML-13		17,800					
Existing (2014)	RML-13B		5,880					
Existing (2014)	RML-15							1,092
Existing (2014)	RML-22							2,624
Existing (2014)	RML-23	2,356						
Existing (2014)	RML-24	700						
Existing (2014)	RML-25		33,901					
Existing (2014)	RML-26	5,664						

Phase	Building	Industrial	Laboratories	Museum	Office	Other Institutional Uses	Service	Warehouse
Existing (2014)	RML-27	1,961						
Existing (2014)	RML-28		111,590					
Existing (2014)	RML-29						7,525	
Existing (2014)	RML-30					3,562		
Existing (2014)	RML-31				29,695			
Existing (2014)	RML-32		4,020					
Existing (2014)	RML-A						24,929	
Existing (2014)	RML-ARM1							2,048
Existing (2014)	RML-ARM2		2,048					
Existing (2014)	RML-HD1						3,072	
Existing (2014)	RML-HD2						1,120	
Existing (2014)	RML-HD3						3,482	
Existing (2014)	RML-HD4						512	
Existing (2014)	RML-HD5						864	
Existing (2014)	RML-SS1							476
Existing (2014)	RML-T23				4,908			
Existing (2014) Total		14,656	247,681	1,867	42,880	3,562	41,504	6,240
Phase 1	ARMCO Addition		1,440					
Phase 1	Building C						30,190	
Phase 1	Demolish Building T-23				-4,908			

Phase	Building	Industrial	Laboratories	Museum	Office	Other Institutional Uses	Service	Warehouse
Phase 1	Demolish HD 1-5						-9,050	
Phase 1	Demolish SS 1-4							-476
Phase 1	Change of Use ARMCO 1		2,048					-2,048
Phase 1 Change From Baseline		0	3,488	0	-4,908	0	21,140	-2,524
Phase 1 Total GSF		14,656	251,169	1,867	37,972	3,562	62,644	3,716
Phase 2	Building D						5,665	
Phase 2	Building G		70,000					
Phase 2	Renovate Building 28	1,000						
Phase 2	Building 22 Change of Use						2,624	-2,624
Phase 2 Change From Baseline		1,000	73,488	0	-4,908	0	29,429	-5,148
Phase 2 Total GSF		15,656	324,657	1,867	33,064	3,562	92,073	-1,432
Phase 3	Building H		13,140					
Phase 3	Building J				10,000			
Phase 3 Change From Baseline		1,000	86,628	0	5,092	0	29,429	-5,148

Phase	Building	Industrial	Laboratories	Museum	Office	Other Institutional Uses	Service	Warehouse
Phase 3 Total GSF		15,656	337,797	1,867	43,064	3,562	92,073	-1,432
Phase 4	Building B		34,315					
Phase 4	Building K			3,400				
Phase 4	Demolish ARMCO 1		-2,048					
Phase 4	Demolish ARMCO 2		-2,048					
Phase 4	Demolish Armco Addition		-1,440					
Phase 4	Demolish Building 12		-7,690					
Total Change From Baseline		1,000	107,717	3,400	5,092	0	29,429	-5,148
Grand Total		15,656	358,886	5,267	43,064	3,562	92,073	-1,432