



STATE OF MONTANA

COMBINED STATE LAB STUDY, A/E #2018-50-01

08.14.2018



TABLE OF CONTENTS

TABLE OF CONTENTS

VOLUME 1

1.0 Project Description and Study Goals
 Acknowledgments 1.1
 Project Description and Study Goals 1.1

2.0 Existing Facilities
 Narrative 2.1
 Orientation Map 2.1
 Department of Livestock Veterinary Diagnostic Laboratory 2.2
 Seed Laboratory 2.3
 Pulse Crops Laboratory 2.4
 Department of Ag Analytical Laboratory 2.5
 Wool Laboratory 2.6
 FWP Wildlife Laboratory 2.7

3.0 Options
 Narrative 3.1
 Baseline Option 3.2
 Option 1 3.5
 Option 2 3.8
 Option 3 3.11

4.0 Design and Construction Schedule
5.0 Architectural Systems Narrative
6.0 Engineered Systems Narrative



PROJECT DESCRIPTION AND STUDY GOALS

ACKNOWLEDGMENTS

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PROJECT DESCRIPTION AND STUDY GOALS

The Clark Enersen Partners are pleased to present this architectural and engineering study to assist the Montana Legislative Finance Committee and the Legislative Fiscal Division in the determination of possible future enhancements and efficiencies concerning six state supported service laboratory facilities in the Bozeman area. The objective of this study is to determine existing deficiencies and needs in the various facilities, formulate an overall program that would meet those needs, and provide a series of options to illustrate how that program, or critical portions of it could be implemented. This report is the product of an intense effort involving the Legislative Fiscal Division, the Study of State Labs Interim Subcommittee, The State Architecture & Engineering Division and the leadership and staffs of all six laboratories. The design team spent several weeks on site over the months preceding this publication, conducting several interviews with all stakeholders and documenting organizational goals, objectives, spatial and equipment needs and facility deficiencies. We are very appreciative of significant time, resources and ideas offered by all involved. This summary provides a brief overview of the programmatic scope, general arrangement, opinion of probable construction costs and schedule associated with the options identified.

EXISTING FACILITIES

EXISTING FACILITIES

The facilities and programs analyzed under this study consist of six separate service laboratory organizations clustered in and around the campus of Montana State University. Three of the service laboratories are located in the Marsh Laboratory Complex and the remaining three are in stand-alone facilities. The Marsh complex houses the Montana Ag Experiment Station Seed Laboratory, the Montana State University Regional Pulse Crops Diagnostic Laboratory and the Department of Livestock Veterinary Diagnostic Laboratory. The Department of Agriculture Analytical Laboratory is housed in McCall Hall, and the Montana Ag Experiment Station Wool Laboratory is housed in the Wool Lab, both on the Montana State University campus. Finally, the Fish, Wildlife and Parks Wildlife Laboratory is located in a service building behind the FWP Region 3 Headquarters. The following pages in this section provide a brief description of each organization, it's location, existing conditions and deficiencies noted during interviews with the design team.

Wool Laboratory:
Montana Ag. Experiment Station Wool Laboratory

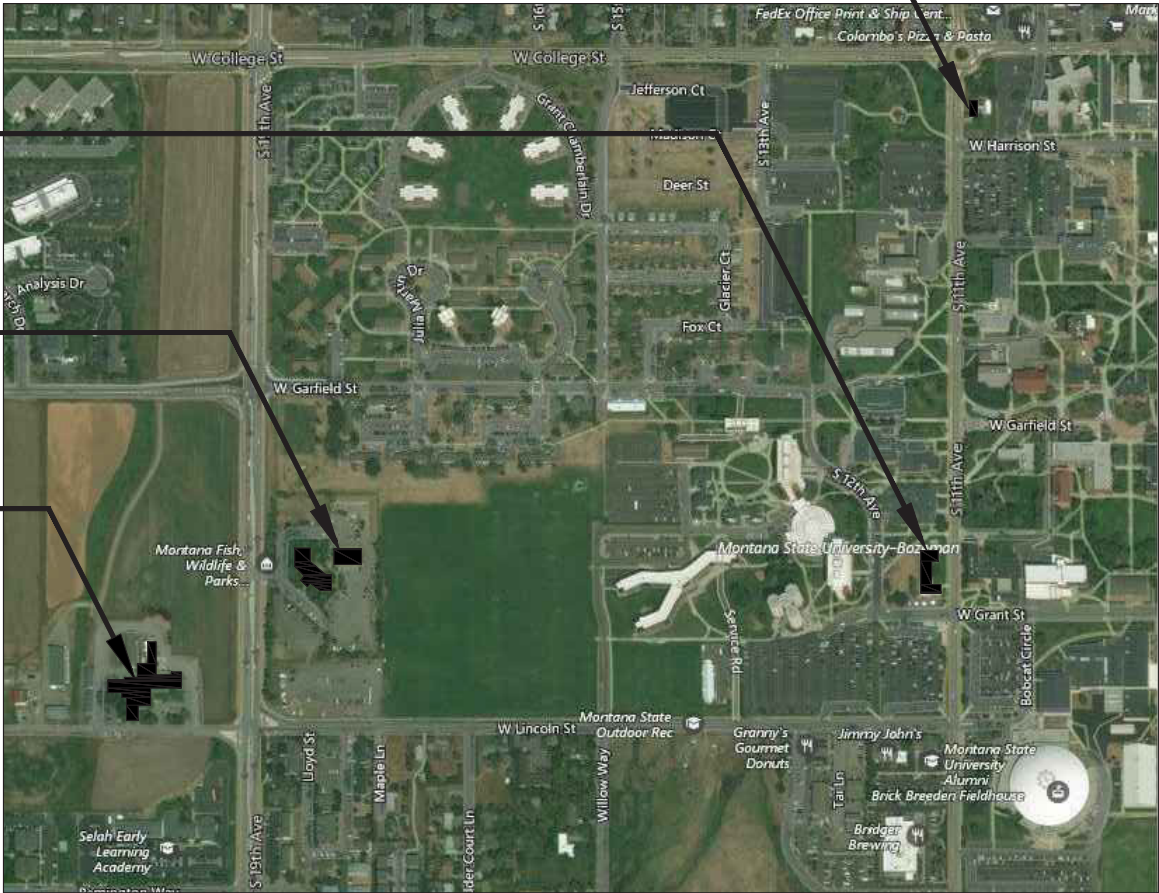
McCall Hall:
Dept. of Agriculture Analytical Laboratory

Dept. of Fish, Wildlife & Parks - Region 3 HQ:
FWP Wildlife Laboratory

Marsh Laboratory:
Montana Ag Experiment Station Seed Laboratory

MSU Regional Pulse Crops Diagnostic Laboratory

Dept. of Livestock Veterinary Diagnostic Laboratory



EXISTING FACILITIES

**DEPARTMENT OF LIVESTOCK VETERINARY
DIAGNOSTIC LABORATORY**

The Dept. of Livestock Veterinary Diagnostic Laboratory (VDL) is the largest tenant housed in Marsh Laboratory. Located on West Lincoln Street, just west of 19th Avenue, the Marsh Laboratory complex was built in 1961 and has undergone numerous minor renovations and additions since then. The VDL is the only institution in Montana that is accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD) and provides critical diagnostic testing serving Montana’s food animal and veterinary industries. Like most accredited veterinary diagnostic laboratories, the facility is separated into dedicated laboratory sections, each with a specialized focus in the rapid detection of veterinary pathogens in the samples and animal carcasses that it receives every day. Due to the age of the structure, outdated HVAC systems and continuously evolving methods and instrumentation in the diagnostic field, the current facility is in need of replacement and continuously in danger of losing its accreditation. The existing space allocation for the VDL includes 11,549 net square feet. Current deficiencies in the VDL include the following:

- Inadequate space sizes, allocation and organization
- Laboratory safety issues including inadequate safety showers, eye washes and egress
- Lack of standby emergency power
- Lack of general power
- Poor ventilation and inadequate make-up air
- Security issues due to multiple public corridors in close proximity to lab spaces handling unknown pathogens
- Biosecurity concerns due to the lack of a properly appointed and certified BSL-3 laboratory space
- Aged finishes and cleanability concerns
- Existence of hazardous materials (asbestos tile and insulation)



Department of Livestock Veterinary Diagnostic Laboratory			
Existing Net Square Footage			
SPACE SUMMARY		Existing Area (Net)	
1.0	VETERINARY DIAGNOSTIC LAB		
Number	Area	Room No.	NSF
1.1	Receiving/Accessioning		424
	Delivery and Night Drop-Off Vestibule	076A	33
	Processing & Accessioning	078	391
1.2	Necropsy & Prep		2,623
	Necropsy Receiving	082	801
	Live Animal Holding	082	115
	Tissue Trimming / Formalin Prep	078A	117
	BSL-2 Necropsy	081	622
	Evidence Storage	082	90
	Outgoing Cooler	082A	94
	Incoming Cooler w/ nightdrop	082A	94
	Lockers, Shower, Gowning & Boot Room	079A, 080A	330
	Incinerator	082	360
1.3	Laboratory Sections & Support		5,668
	Clinical Pathology 1.3.1		
	Clinical Pathology Laboratory	088	382
	Histology 1.3.2		
	Histology Laboratory	096	409
	Histology Equipment Room	096A	65
	Histology Slide/Block Storage	067, 97A	152
	Bacteriology 1.3.3		
	Bacteriology Laboratory	087	584
	Bacteriology Dirty Room	084	284
	Bacteriology Equipment	086	81
	Virology 1.3.4		
	Virology Laboratory	090, 093	452
	Virology Fluorescent Microscopy	092	23
	Virology Equipment Room	091	90
	Serology 1.3.5		
	Serology Laboratory	094	608
	Molecular Diagnostics 1.3.6		
	Molecular Diagnostics Extraction	116	346
	Molecular Diagnostics Clean Room	116B	181
	Molecular Diagnostics Amplification	112	257
	Molecular Diagnostics Storage	116F	68
NA	DNA Sequencing 1.3.7		
	Milk 1.3.8		
	Milk Laboratory	095	603
NA	Food Safety 1.3.9		
	Shared Laboratory Support 1.3.10		
	Sterilization, Glassware & Pure Water	73	717
	Media Prep Lab	073	100
	Biohazard Sterilization	075A	81
	Hazardous Waste	082	115
	Laundry Room	075	70
1.4	Biocountainment		0
NA			
1.5	Office & Support		2,834
	Reception and Waiting	077	570
	Director Office	083B	116
	Quality Manager Office	097	215
	Pathologist Office	083A, 114	256
	Library/Rounds Room	083	122
	Multipurpose/Seminar Room	060	629
	Break Room	101	300
	Storage	075	318
	Server Room	100	308
	Subtotal - Veterinary Diagnostic Lab		11,549

SEED LABORATORY

The Montana Agricultural Experiment Station Seed Laboratory is also housed in Marsh Laboratory, occupying a relatively small footprint in the west wing. The organization provides seed analysis for farmers, regulatory agencies and industry groups. It also maintains a very large collection of seed samples that are intended to date back three years, but space constraints have made that policy difficult to meet. The main laboratory area for the Seed Lab received a light renovation recently and the lab operations are not particularly stringent as there is little use of hazardous materials or chemicals. The main deficiency associated with the Seed Lab is a lack of space that is the result of sharing space with the expanding operations of the Pulse Crops Laboratory. If the Pulse Crops Lab were to be relocated in the Marsh Laboratory Complex, the Seed Lab could expand into that area with little or no renovations to alleviate most of their deficiencies. The existing space allocation for the Seed Laboratory includes 1,763 net square feet. Current deficiencies in the Seed Laboratory include the following:

- Inadequate space sizes
- Lack of standby emergency power (for growth chambers)
- Lack of general power
- Aged finishes and cleanability concerns



Montana Ag Experiment Station Seed Laboratory Existing Net Square Footage

SPACE SUMMARY		Existing Area (Net)	
5.0	SEED LAB		
Number	Area	Room No.	NSF
5.1	Seed Lab		1,763
5.1.1	Receiving	040	94
5.1.2	Purity Laboratory	054	546
5.1.3	Dividing Room	051	105
5.1.4	Germination Laboratory	024	468
5.1.5	Germinator/Growth Chamber Room	038	169
5.1.6	Sample Storage	043, Trailer	240
5.1.7	Director Office	027	141
Subtotal - Seed Lab			1,763

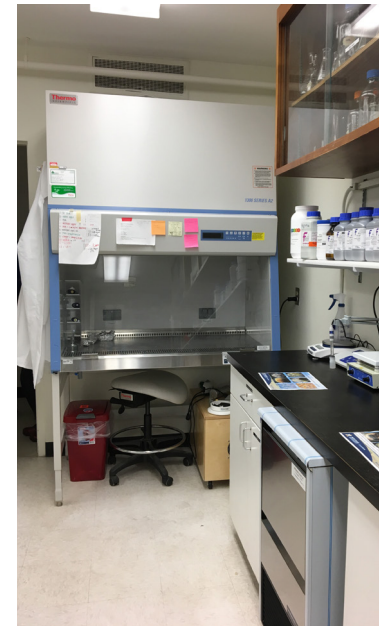


EXISTING FACILITIES

PULSE CROPS LABORATORY

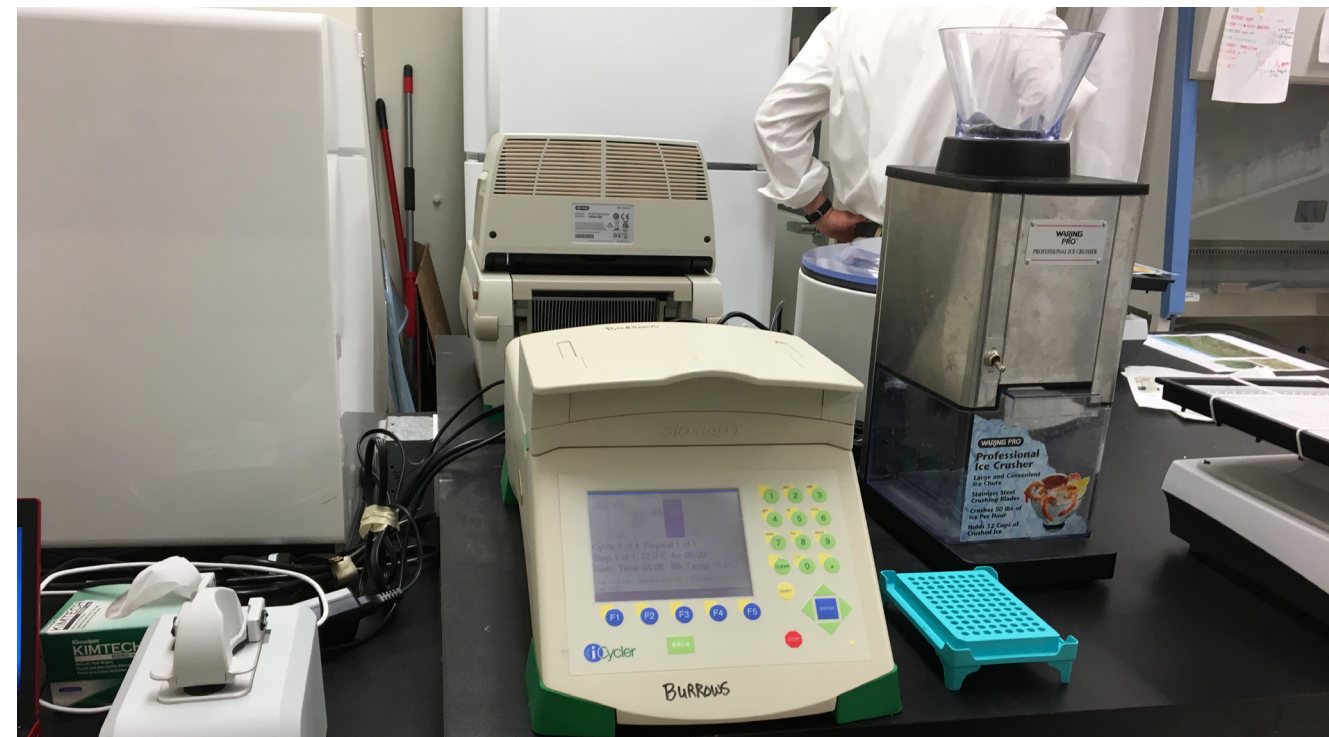
The Montana State University Pulse Crops Laboratory is the last of the three organizations housed in the Marsh Laboratory Complex. It is located in the west wing directly across and adjacent to the Seed Laboratory and shares some of its resources such as a sample receiving area, germination laboratory and growth chamber space. The Pulse Crops Lab is presently occupying just 751 net square feet which is a small fraction of what it needs to perform efficiently. The lab also uses greenhouse space on campus and has requested that a small new greenhouse be constructed attached or adjacent to the Marsh Lab Complex to alleviate the problem of transporting plant materials on a regular basis. If the Pulse Crops Lab is provided with new or renovated space, it will be critical to ensure that the Seed Lab is located within the same building due to the continued sharing of functions, but the staffs of both labs have stated that the two areas do not need to be directly adjacent. Current deficiencies in the Pulse Crops Laboratory include the following:

- Inadequate space allocation and size – significant growth in lab and equipment space is needed
- Laboratory safety issues including inadequate safety showers, eye washes and egress
- Lack of standby emergency power
- Lack of general power
- Aged finishes and cleanability concerns
- Need of a small, local greenhouse



**Montana State University Regional Pulse Crops Laboratory
Existing Net Square Footage**

SPACE SUMMARY		Existing Area (Net)	
6.0	PULSE LAB		
Number	Area	Room No.	NSF
6.1	Pulse Lab		751
6.1.1	Sample Processing Laboratory	024	312
6.1.2	Molecular Biology Laboratory	021	287
6.1.4	Germinator/Growth Chamber Room	038	42
6.1.9	Director Office	036	110
Subtotal - Pulse Lab			751



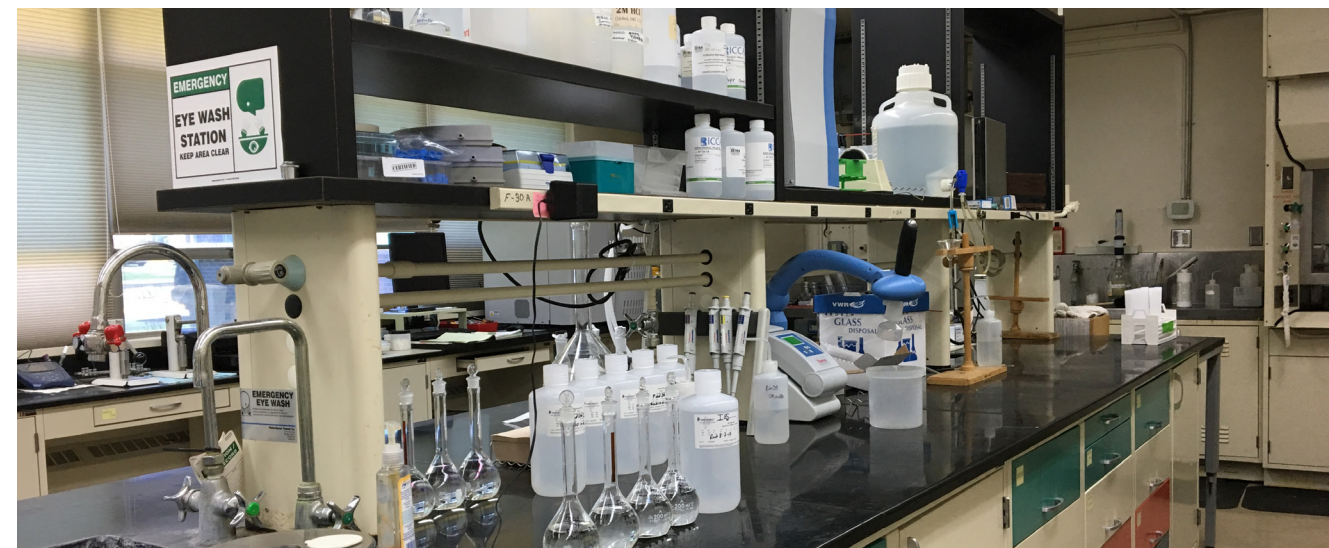
DEPARTMENT OF AGRICULTURE ANALYTICAL LABORATORY

The Department of Agriculture Analytical Laboratory is located in McCall Hall at the northwest corner of Grant Street and 11th Avenue near the center of the Montana State University campus. It provides testing on pesticide residues in water, soil, vegetation and animal tissues as well as verification of product ingredients in pesticide, animal feeds and fertilizer. These services are provided to state ranchers, farmers, manufacturers, research organizations and regulatory agencies at the state and national level. Of all the laboratory facilities included in this study, the Analytical Lab works with most chemically hazardous samples and materials and has the greatest need for properly functioning chemical fume hood containment devices and a properly balanced laboratory air flow system. The structure, built in 1952 originally housed what is now the film and photography department and included the university's television studio. The Department of Agriculture Analytical Lab has occupied most of the facility for many years and has made minor upgrades to accommodate new instrumentation and improve air flow over the years. While a comprehensive engineering analysis has not been completed as part of this study, our on-site survey indicates that make up air, laboratory exhaust and laboratory air flow controls are inadequate for the hazardous chemical environment in the Analytical Lab. The facility users have stated that the building's location can sometimes be problematic for their clients due to heavy traffic in the heart of campus, lack of parking and unsuitable truck access. The facility is almost entirely occupied by the Analytical Lab and is comprised of approximately 6,708 net square feet. Current deficiencies in the Department of Agriculture Analytical Laboratory include the following:

- Space sizes are mostly adequate although some additional space could alleviate a few areas of concern for some of the instrumentation needs. The overall layout is not optimized for the general work and material flow for the lab
- The current layout of the building entrance and general organization of the plan compromises overall building security and monitoring
- Laboratory safety issues including inadequate safety showers, eye washes and egress
- Laboratory airflow and exhaust are major concerns due to the highly hazardous chemical nature of the work performed in the lab
- Lack of standby emergency power
- Lack of general power
- Aged finishes and cleanability concerns



Department of Agriculture Analytical Laboratory Existing Net Square Footage			
SPACE SUMMARY		Existing Area (Net)	
4.0	ANALYTICAL LAB		
4.1	Laboratories & Support		5,055
	Feed & Fertilizer		
4.1.1	Feed/Fertilizer Sample Prep	001A, 001B	545
4.1.2	Feed/Fertilizer Sample Prep & Balance	012	216
4.1.3	Feed/Fertilizer Chemistry Lab	019, 039	758
4.1.4	ICP Room	016, 016A	263
	Pesticide & Groundwater		
4.1.5	Pesticide Sample Prep	020	165
4.1.6	Low-Level Pesticide/Groundwater Laboratory	001C	442
4.1.7	Medium-Level Pesticide Laboratory	014	452
4.1.8	High-Level Pesticide Laboratory	031	150
4.1.9	Pesticide LCMS	024	248
	Shared Space		
4.1.10	Feed/Fertilizer/Pesticide Lab	021, 038	649
4.1.11	Feed/Pesticide GCMS	025	354
4.1.12	Freezer/Standards Room	034	107
4.1.13	Oven Room	038A	29
4.1.14	Cooler Room	033	43
4.1.16	Hazardous Waste	032, 036	100
4.1.17	Chemical Storage	013	195
4.1.18	Receiving & Storage	001C	339
4.2	Office & Support		1,653
4.2.1	Receiving & Reception	010	367
4.2.2	Bureau Chief Office	009	215
4.2.3	Program Managers Office	011	161
4.2.4	Staff Office	023, 026	578
4.2.5	Office Work Room	010	111
4.2.7	Break Room	008	221
	Subtotal - Analytical Lab		6,708



EXISTING FACILITIES

WOOL LABORATORY

The Montana Ag Experiment Station Wool Laboratory is in a stand-alone historical building located at a major vehicular entrance on the north side of the Montana State University campus at the intersection of Harrison Street and 11th Avenue. The building was constructed in 1947 and is a two story, wood framed structure with a walk-out basement, storage attic and a large garage area in the rear. It is one of only two facilities in the country that provide wool fiber and fleece analysis to aid breeders in the selection of genetic traits, and the operation shares a long and significant history with Montana State University. There are two major services provided by the Wool Lab that are difficult to accommodate in the historic structure. One of their most important analytical tools is the Optical Fiber Diameter Analyzer. This instrument should be located in a controlled laboratory environment where temperature and humidity can be reliably controlled, but no such space exists in the current facility. Another routine procedure involves boiling fleece samples in chemicals for which the existing exhaust system is not suitable. If the Wool Lab is to remain in the historic structure, certain spaces should be upgraded to accommodate these needs. Periodic national meetings and conferences involving breeders are also held in the Wool Lab and have become difficult to accommodate as the number of attendees has grown. Truck access is also a challenge on the existing site. The overall space and size of the facility is large enough to accommodate their needs now and into the future. The building is comprised of approximately 4,781 net square feet. Current deficiencies in the Wool Laboratory include the following:

- Laboratory safety issues including inadequate safety showers, eye washes and egress
- Poor vehicular and truck access
- Poor laboratory ventilation to accommodate certain procedures
- Lack of environmental temperature and humidity control for specialized instrumentation
- Security issues due to public corridors with direct access to the entrance of hazardous laboratory environments
- Aged finishes and cleanability concerns



Montana Ag Experiment Station Wool Laboratory
Existing Net Square Footage

SPACE SUMMARY		Existing Area (Net)	
2.0	WOOL LAB		
Number	Area	Room No.	NSF
2.1	Wool Lab		4,781
2.1.1	Receiving Garage & Sample Storage	008, 010	1,563
2.1.2	Analytical Laboratory	102	292
2.1.3	Wet Chemistry Laboratory	001, 003, 004	1,090
2.1.4	45-Person Classroom	101	458
2.1.5	Director Office	107	157
2.1.6	Open Office	108	238
2.1.7	Storage	002, 103, 105, Attic	825
2.1.8	Vacated Office	106	158
Subtotal - Wool Lab			4,781



DEPARTMENT OF FISH WILDLIFE AND PARKS, WILDLIFE LABORATORY

The Fish Wildlife and Parks Wildlife Laboratory is located in on the east side of 19th Avenue across from Marsh Laboratory on the site of the FWP Region 3 headquarters. Situated in a stand-alone structure to the east of the main building, the Wildlife Lab consists of a main necropsy space with a small wet laboratory and walk-in cooler / freezer space. The facility was undergoing a minor renovation at the time the initial discovery phase of this study began. The renovation has created the small wet lab space with a new chemical fume hood, improved the ventilation and made provision to add an overhead monorail system for the necropsy floor. The renovation also added a small storage room to accommodate a mobile x-ray unit that is often used in forensic investigation. The facility is not equipped with a means to dispose of carcasses so the Wildlife Lab is required to transport it's large animal waste across 19th Avenue to the incinerator at the VDL. This represents both a deficiency in both efficiency and biosecurity. Users of the Wildlife Lab, however, have stated that it is advantageous to be co-located with the FWP Region 3 for the purpose of increased interaction with field personnel and game wardens.

- Lack of proximity to incinerator or digester for carcass disposal



**Fish, Wildlife & Parks - Wildlife Laboratory
Existing Net Square Footage**

SPACE SUMMARY		Existing Area (Net)	
3.0 FWP WILDLIFE LAB			
Number	Area	Room No.	NSF
3.1	FWP Wildlife Lab		2,992
3.1.1	Reception & Open Office		470
3.1.2	Director Office		90
3.1.3	Staff Office		272
3.1.8	Lockers, Shower, Gowning & Boot Room		280
3.1.9	Sample Prep		221
3.1.10	Necropsy		400
3.1.11	Holding Cooler		135
3.1.12	Holding Freezer		80
3.1.14	Laundry & Equipment Room		97
3.1.15	Laboratory Storage		565
3.1.16	Garage		382
Subtotal - FWP Wildlife Lab			2,992



OPTIONS NARRATIVE

In accordance with the requirements of House Bill 661 of the 65th Legislative session, three options have been presented as part of this study. The programming process used to define the scope of these three options included an initial discovery phase, followed by a programming phase prior to tabulation of the scope and cost for each option. This involved a series of interviews and facility inspections to ascertain what areas of each program are in need of additional space or accommodation for critical equipment. In many cases, the growth in square footage represented in the program is due to the natural evolution in technologies and growth in services offered, leading to cramped spaces and critical instrumentation that is not adequately accommodated. A significant portion of the growth represented in the program is also due to modern laboratory safety and accessibility issues. As laboratory safety standards have evolved, the clear travel width and module size has grown to allow for greater flexibility and safe movement for laboratory technicians, cart traffic and large instrumentation. Finally, a third area of growth is represented by new functions that have become commonplace since these facilities were originally constructed or most recently renovated. The addition of BSL-3 laboratory space to provide enhanced bio-safety and bio-security as well as a growing reliance on the instrumentation heavy practice of molecular diagnostics are prime examples.

The first task of the study was to define the optimal spatial scope for each of the six organizations. The findings of that initial process are quantified in a portion of the study we have called the Baseline Option. In the Baseline option, all six organizations are represented as if their facilities were built as new construction, optimized for efficiency and safety and each provided with dedicated features and spatial expansion requested for their mission.

Finally, it should be noted that the FWP Wildlife Laboratory was included in this study to analyze potential synergies between that lab and the VDL. The FWP Wildlife Lab presently uses the incinerator at the VDL and routinely orders some VDL diagnostic services. Both of these functions require transporting samples, waste and carcasses from the Wildlife Lab to the VDL. The Wildlife Lab also periodically asks for consultation from the staff of pathologists at the VDL. Beyond these relationships, there are no specific functions or spaces that the administration or staff of either facility believe could be combined or shared. For this reason, the FWP Wildlife Lab has not been moved, renovated or affected under each of the options shown.

Options 1, 2 & 3 were created by prioritizing the most critical programmatic elements from the Baseline Option in close consultation with the Legislative Fiscal Division. Each of the options is described including construction costs in the following pages.

COST ESTIMATING METHODOLOGY

The estimated costs for construction in this study were formulated by applying a per gross square foot estimate based on the design team's historical database and their knowledge of the bidding climate. The square footage costs are unique to specific space types and are dependent on the level of finish, built-in furnishings, and the complexity of the engineered systems that will serve those space types. The per gross square foot estimate includes all costs typically assumed by the contractor including overhead, profit and general conditions. Once the contractor's construction cost is established, a 10% design contingency is added as well as a 4% annual escalation rate projected to an assumed mid-point of construction to provide a total construction cost. Project associated costs are assumed to be an additional 25% of the total construction cost and typically include design fees, owner's management fees, loose furnishings, commissioning, A/V equipment, testing, permits and moving expenses.

SITE AND UTILITY COSTS

All of the options shown in this study include some scope of new construction that is assumed to be built either on a green field site or possibly as an addition to an existing structure. This study does not include any provision for site selection and in turn does not include any analysis of the cost burden associated with potential sites. For that reason, the design team has been asked to omit all costs for site improvements in the tabulations presented.

- Land purchases
- Zoning analysis
- Demolition of existing structures
- Traffic analysis and traffic control measures
- Curb cuts and site access
- Required site grading due to changes in elevation
- Site utilities and distances involved to providing electrical power, sanitary sewer, storm sewer, natural gas, domestic water and fire lines from the nearest mains
- Demolition of existing structures
- On-site roadways and parking lots
- On-site pedestrian access and paving
- Site signage
- On-site dock area and service yard paving

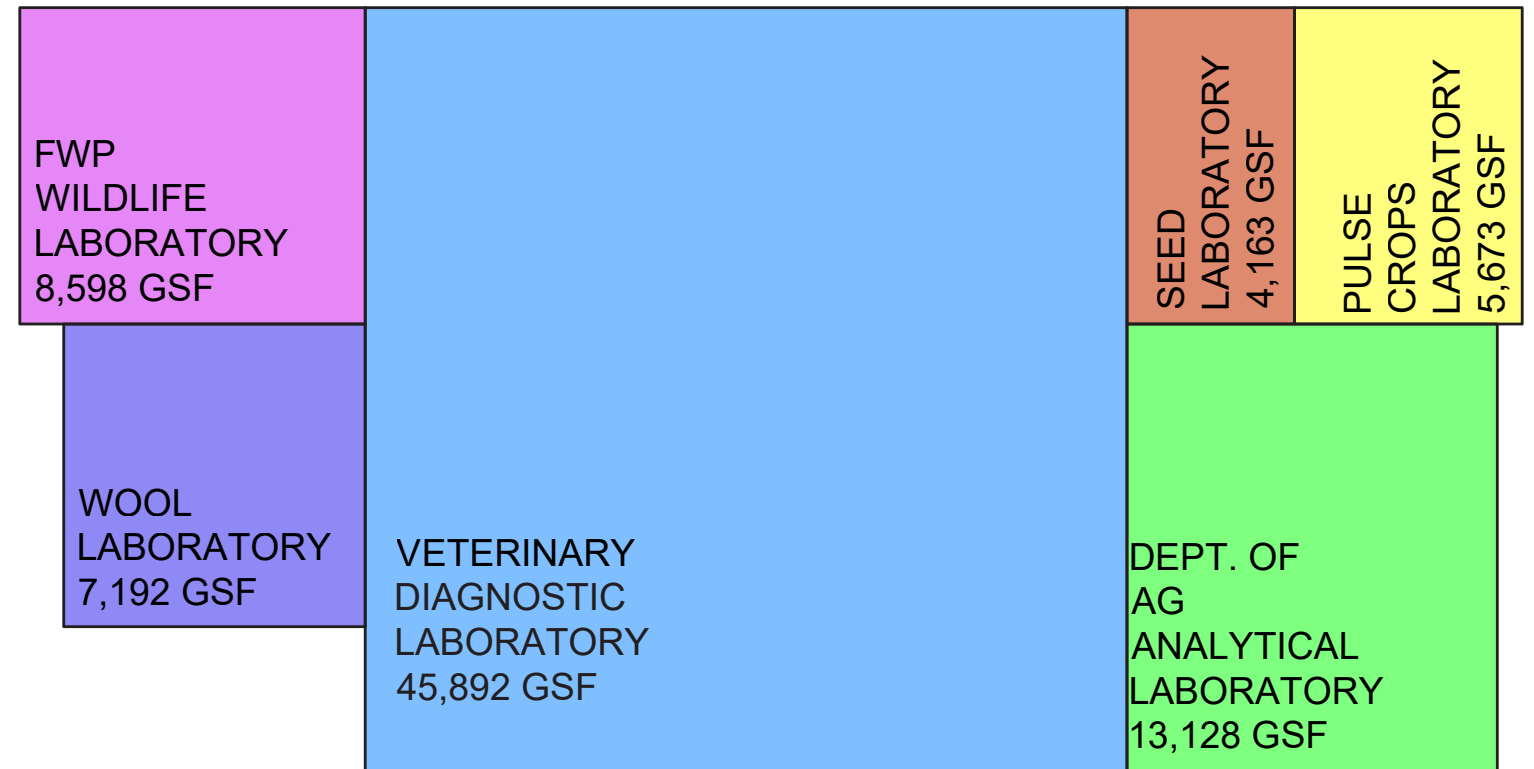
The costs for this work can vary greatly depending on the selected site, but it should be assumed that each option presented will carry an additional cost burden not included in this study that could be in the range of \$1,000,000 to \$2,500,000 and that these costs, if borne by the contractor, would have similar associated mark-ups for escalation and project associated soft costs.

BASELINE OPTION

The Baseline Option provides the overall scope and an order of magnitude project cost to provide new stand-alone space for all six laboratory facilities considered as part of the study. In this scheme, it is assumed that all six departments are co-housed in new construction and all existing spaces vacated by those departments are left in their existing condition with no renovation. For the purposes of establishing the baseline option, it is assumed that all funds associated with readying the vacated spaces for use by other programs would come from a different budget than that intended for design, construction, furnishings and soft costs associated with the new construction. The Baseline Option is not intended to be a recommendation of this study. It is instead an accounting of the total scope and requested space for all six facilities to be used for comparison purposes against the recommended options that appear later in this document.

The complete tabulation of all spaces, square footages, estimated costs and estimated soft costs for the Baseline Option (excluding site work and utilities) is shown on the following pages. It is estimated that the total gross square footage needed to accommodate all functions in new construction is 84,647 GSF at approximately \$490 per square foot before the addition of soft costs. The total project escalated to a mid-point of construction in the Winter of 2021 is estimated to be approximately \$51,800,000.

Baseline Option



NEW BUILDING SCALE STUDY

OPTIONS

State of Montana
 Combined State Lab Study
 August 14, 2018



Baseline Option

SPACE SUMMARY		Existing Area (Net)		Proposed Area (Net)			Proposed Area (Gross)		Estimated Cost		
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost
1.0	VETERINARY DIAGNOSTIC LAB										
1.1	Receiving/Accessioning		424			1,573	1,149		2,622		\$ 862,125
1.1.1	Walk-In Samples			1	363	363	363	60%	605	\$ 300	\$ 181,500
1.1.2	Conference Room			1	242	242	242	60%	403	\$ 300	\$ 121,000
1.1.3	Unisex Restroom			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.1.4	Delivery and Night Drop-Off Vestibule	076A	33	1	121	121	88	60%	202	\$ 325	\$ 65,542
1.1.5	Processing & Accessioning	078	391	1	726	726	335	60%	1,210	\$ 350	\$ 423,500
1.2	Necropsy & Prep		2,623			4,599	1,976		7,665		\$ 4,457,667
1.2.1	Necropsy Receiving	082	801	1	363	363	-438	60%	605	\$ 400	\$ 242,000
1.2.2	Live Animal Holding	082	115	1	363	363	248	60%	605	\$ 400	\$ 242,000
1.2.3	Tissue Trimming / Formalin Prep	078A	117	1	242	242	125	60%	403	\$ 450	\$ 181,500
1.2.4	BSL-2 Necropsy	081	622	1	1,089	1,089	467	60%	1,815	\$ 750	\$ 1,361,250
1.2.5	Evidence Storage	082	90	1	121	121	31	60%	202	\$ 400	\$ 80,667
1.2.6	Photography & Drug Storage			1	242	242	242	60%	403	\$ 400	\$ 161,333
1.2.7	Outgoing Cooler	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.8	Incoming Cooler w/ nightdrop	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.9	Lockers, Shower, Gowning & Boot Room	079A, 080A	330	1	1,089	1,089	759	60%	1,815	\$ 550	\$ 998,250
1.2.10	Necropsy Storage			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.2.11	Incinerator	082	360	1	484	484	124	60%	807	\$ 900	\$ 726,000
1.2.12	Formalin fixed storage		0	1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3	Laboratory Sections & Support		5,668			12,043	6,375		20,072		\$ 8,361,250
	Clinical Pathology 1.3.1										
1.3.1.1	Clinical Pathology Laboratory	088	382	1	726	726	344	60%	1,210	\$ 400	\$ 484,000
1.3.1.2	Clinical Pathology Equipment Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.1.3	Clinical Pathology Microscopy Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
	Histology 1.3.2										
1.3.2.1	Histology Laboratory	096	409	1	726	726	317	60%	1,210	\$ 400	\$ 484,000
1.3.2.2	Histology Equipment Room	096A	65	1	182	182	117	60%	303	\$ 350	\$ 106,167
1.3.2.3	Histology Slide/Block Storage	067, 97A	152	1	363	363	211	60%	605	\$ 350	\$ 211,750
	Bacteriology 1.3.3										
1.3.3.1	Bacteriology Laboratory	087	584	1	726	726	142	60%	1,210	\$ 400	\$ 484,000
1.3.3.2	Bacteriology Dirty Room	084	284	1	121	121	-163	60%	202	\$ 400	\$ 80,667
1.3.3.3	Bacteriology Microscopy			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.3.4	Bacteriology Equipment	086	81	1	182	182	101	60%	303	\$ 350	\$ 106,167
	Virology 1.3.4										
1.3.4.1	Virology Laboratory	090, 093	452	1	726	726	274	60%	1,210	\$ 400	\$ 484,000
1.3.4.2	Virology Fluorescent Microscopy	092	23	1	121	121	98	60%	202	\$ 400	\$ 80,667
1.3.4.3	Virology Equipment Room	091	90	1	182	182	92	60%	303	\$ 350	\$ 106,167
1.3.4.5	Virology Clean Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.4.6	Virology Dirty Room			1	182	182	182	60%	303	\$ 400	\$ 121,333
	Serology 1.3.5										
1.3.5.1	Serology Laboratory	094	608	1	726	726	118	60%	1,210	\$ 400	\$ 484,000
1.3.5.2	Serology Centrifuge & Liquid Handling			1	182	182	182	60%	303	\$ 400	\$ 121,333
1.3.5.3	Serology Equipment Room			1	182	182	182	60%	303	\$ 350	\$ 106,167
	Molecular Diagnostics 1.3.6										
1.3.6.1	Molecular Diagnostics Sample Prep			1	363	363	363	60%	605	\$ 400	\$ 242,000
1.3.6.2	Molecular Diagnostics Extraction	116	346	1	363	363	17	60%	605	\$ 400	\$ 242,000
1.3.6.3	Molecular Diagnostics Clean Room	116B	181	1	182	182	1	60%	303	\$ 400	\$ 121,333
1.3.6.4	Molecular Diagnostics Amplification	112	257	1	182	182	-76	60%	303	\$ 400	\$ 121,000
1.3.6.5	Molecular Diagnostics Freezer Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.6.6	Molecular Diagnostics Storage	116F	68	1	121	121	53	60%	202	\$ 350	\$ 70,583
	DNA Sequencing 1.3.7										
1.3.7.1	DNA Sequencing Laboratory Suite			1	726	726	726	60%	1,210	\$ 400	\$ 484,000
	Milk 1.3.8										
1.3.8.1	Milk Laboratory	095	603	1	1,089	1,089	486	60%	1,815	\$ 400	\$ 726,000
1.3.8.2	Milk Laboratory Equipment			1	363	363	363	60%	605	\$ 350	\$ 211,750

SPACE SUMMARY		Existing Area (Net)		Proposed Area (Net)			Proposed Area (Gross)		Estimated Cost			
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost	
Food Safety 1.3.9												
1.3.9.1	Food Safety Laboratory			1	726	726	726	60%	1,210	\$ 400	\$ 484,000	
1.3.9.2	Food Safety Sterilization & Equipment			1	121	121	121	60%	202	\$ 600	\$ 121,000	
Shared Laboratory Support 1.3.10												
1.3.10.1	Sterilization, Glassware & Pure Water		73	717	1	726	726	9	60%	1,210	\$ 750	\$ 907,500
1.3.10.2	Media Prep Lab	073	100	1	121	121	21	60%	202	\$ 400	\$ 80,667	
1.3.10.3	Biohazard Sterilization	075A	81	1	121	121	40	60%	202	\$ 750	\$ 151,250	
1.3.10.4	Freezer Farm			1	363	363	363	60%	605	\$ 350	\$ 211,750	
1.3.10.5	Hazardous Waste	082	115	1	242	242	127	60%	403	\$ 400	\$ 161,333	
1.3.10.6	Laundry Room	075	70	1	121	121	51	60%	202	\$ 300	\$ 60,500	
1.3.10.7	Chemical Storage			1	182	182	182	60%	303	\$ 400	\$ 121,000	
1.4	Biocontainment		0			2,360	2,360		3,933		\$ 2,919,667	
1.4.1	Lockers, Shower, Gowning & Boot Room			1	363	363	363	60%	605	\$ 550	\$ 332,750	
1.4.2	Autoclave Sterilization			1	182	182	182	60%	303	\$ 650	\$ 197,167	
1.4.3	Equipment Decontamination Airlock			1	121	121	121	60%	202	\$ 650	\$ 131,083	
1.4.4	BSL-3 Laboratory			1	726	726	726	60%	1,210	\$ 800	\$ 968,000	
1.4.5	BSL-3 Specialized Laboratory			2	121	242	242	60%	403	\$ 800	\$ 322,667	
1.4.6	BSL-2 Enhanced Necropsy			1	726	726	726	60%	1,210	\$ 800	\$ 968,000	
1.5	Office & Support		2,834			6,960	4,126		11,600		\$ 3,284,333	
1.5.1	Reception and Waiting	077	570	1	800	800	230	60%	1,333	\$ 280	\$ 373,333	
1.5.2	Director Office	083B	116	1	140	140	24	60%	233	\$ 280	\$ 65,333	
1.5.3	Associate Director Office			1	120	120	120	60%	200	\$ 280	\$ 56,000	
1.5.4	Administrative Conference Room			1	300	300	300	60%	500	\$ 280	\$ 140,000	
1.5.5	Business Manager Office			1	120	120	120	60%	200	\$ 280	\$ 56,000	
1.5.6	Quality Manager Office	097	215	1	120	120	-95	60%	200	\$ 280	\$ 56,000	
1.5.7	Pathologist Office	083A, 114	256	4	120	480	224	60%	800	\$ 280	\$ 224,000	
1.5.8	Open Office			25	60	1,500	1,500	60%	2,500	\$ 260	\$ 650,000	
1.5.9	Library/Rounds Room	083	122	1	300	300	178	60%	500	\$ 280	\$ 140,000	
1.5.10	Conference Room			2	120	240	240	60%	400	\$ 280	\$ 112,000	
1.5.11	Multipurpose/Seminar Room	060	629	1	800	800	171	60%	1,333	\$ 300	\$ 400,000	
1.5.12	Break Room	101	300	1	500	500	200	60%	833	\$ 300	\$ 250,000	
1.5.13	Shipping			1	120	120	120	60%	200	\$ 300	\$ 60,000	
1.5.14	Staff Lockers			1	300	300	300	60%	500	\$ 450	\$ 225,000	
1.5.15	Storage	075	318	1	1,000	1,000	682	60%	1,667	\$ 250	\$ 416,667	
1.5.16	Server Room	100	308	1	120	120	-188	60%	200	\$ 300	\$ 60,000	
Subtotal - Veterinary Diagnostic Lab			11,549			27,535	15,986		45,892		\$ 19,885,042	
2.0	WOOL LAB											
2.1	Wool Lab											
2.1.1	Receiving Garage & Sample Storage	008, 010	1,563	1	1,452	1,452	-111	60%	2,420	\$ 200	\$ 484,000	
2.1.2	Analytical Laboratory	102	292	1	363	363	71	60%	605	\$ 400	\$ 242,000	
2.1.3	Wet Chemistry Laboratory	001, 003, 004	1,090	1	484	484	-606	60%	807	\$ 430	\$ 346,867	
2.1.4	45-Person Classroom	101	458	1	908	908	450	60%	1,513	\$ 325	\$ 491,833	
2.1.5	Director Office	107	157	1	140	140	-17	60%	233	\$ 280	\$ 65,333	
2.1.6	Open Office	108	238	1	242	242	4	60%	403	\$ 260	\$ 104,867	
2.1.7	Storage	002, 103, 105, Attic	825	1	726	726	-99	60				

OPTIONS

3.0 FWP WILDLIFE LAB							Net-to-Gross	GSF	Cost/GSF	Cost
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.			
3.1	FWP Wildlife Lab		2,992			5,159	2,167	8,598		\$ 3,576,750
3.1.1	Reception & Open Office		470	1	242	242	-228	60%	403	\$ 112,933
3.1.2	Director Office		90	1	140	140	50	60%	233	\$ 65,333
3.1.3	Staff Office		272	2	120	240	-32	60%	400	\$ 104,000
3.1.4	Open Office / Seasonal Labor		0	4	60	240	240	60%	400	\$ 104,000
3.1.5	Break Room			1	121	121	121	60%	202	\$ 56,467
3.1.6	Work Room			1	121	121	121	60%	202	\$ 56,467
3.1.7	Office Storage Room			1	121	121	121	60%	202	\$ 50,417
3.1.8	Lockers, Shower, Gowning & Boot Room		280	1	484	484	204	60%	807	\$ 443,667
3.1.9	Sample Prep		221	1	242	242	21	60%	403	\$ 161,333
3.1.10	Necropsy		400	1	726	726	326	60%	1,210	\$ 907,500
3.1.11	Holding Cooler		135	1	182	182	47	60%	303	\$ 151,667
3.1.12	Holding Freezer		80	1	182	182	102	60%	303	\$ 166,833
3.1.13	Molecular Diagnostics & DNA Sequencing			1	1,089	1,089	1,089	60%	1,815	\$ 726,000
3.1.14	Laundry & Equipment Room		97	1	182	182	85	60%	303	\$ 91,000
3.1.15	Laboratory Storage		565	1	484	484	-81	60%	807	\$ 258,133
3.1.16	Garage		382	1	363	363	-19	60%	605	\$ 121,000
Subtotal - FWP Wildlife Lab			2,992		5,159	2,167		8,598		\$ 3,576,750
4.0 ANALYTICAL LAB							Net-to-Gross	GSF	Cost/GSF	Cost
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.			
4.1	Laboratories & Support		5,055			6,414	1,359	10,690		\$ 4,552,333
Feed & Fertilizer										
4.1.1	Feed/Fertilizer Sample Prep	001A, 001B	545	1	484	484	-61	60%	807	\$ 346,867
4.1.2	Feed/Fertilizer Sample Prep & Balance	012	216	1	242	242	26	60%	403	\$ 173,433
4.1.3	Feed/Fertilizer Chemistry Lab	019, 039	758	1	726	726	-32	60%	1,210	\$ 520,300
4.1.4	ICP Room	016, 016A	263	1	242	242	-21	60%	403	\$ 193,600
Pesticide & Groundwater										
4.1.5	Pesticide Sample Prep	020	165	1	182	182	17	60%	303	\$ 130,433
4.1.6	Low-Level Pesticide/Groundwater Laboratory	001C	442	1	484	484	42	60%	807	\$ 346,867
4.1.7	Medium-Level Pesticide Laboratory	014	452	1	484	484	32	60%	807	\$ 346,867
4.1.8	High-Level Pesticide Laboratory	031	150	1	242	242	92	60%	403	\$ 193,600
4.1.9	Pesticide LCMS	024	248	1	484	484	236	60%	807	\$ 346,867
Shared Space										
4.1.10	Feed/Fertilizer/Pesticide Lab	021, 038	649	1	726	726	77	60%	1,210	\$ 520,300
4.1.11	Feed/Pesticide GCMS	025	354	1	484	484	130	60%	807	\$ 387,200
4.1.12	Freezer/Standards Room	034	107	1	121	121	14	60%	202	\$ 86,717
4.1.13	Oven Room	038A	29	1	242	242	213	60%	403	\$ 193,600
4.1.14	Cooler Room	033	43	1	182	182	139	60%	303	\$ 130,433
4.1.15	Secured Sample Storage			1	121	121	121	60%	202	\$ 86,717
4.1.16	Hazardous Waste	032, 036	100	1	242	242	142	60%	403	\$ 173,433
4.1.17	Chemical Storage	013	195	1	242	242	47	60%	403	\$ 173,433
4.1.18	Receiving & Storage	001C	339	1	484	484	145	60%	807	\$ 201,667
4.2	Office & Support		1,653			1,463	-190	2,438		\$ 679,400
4.2.1	Receiving & Reception	010	367	1	363	363	-4	60%	605	\$ 169,400
4.2.2	Bureau Chief Office	009	215	1	140	140	-75	60%	233	\$ 65,333
4.2.3	Program Managers Office	011	161	1	140	140	-21	60%	233	\$ 65,333
4.2.4	Staff Office	023, 026	578	1	300	300	-278	60%	500	\$ 130,000
4.2.5	Office Work Room	010	111	1	120	120	9	60%	200	\$ 56,000
4.2.6	Conference Room			1	200	200	200	60%	333	\$ 93,333
4.2.7	Break Room	008	221	1	200	200	-21	60%	333	\$ 100,000
Subtotal - Analytical Lab			6,708		7,877	1,169		13,128		\$ 5,231,733

5.0 SEED LAB							Net-to-Gross	GSF	Cost/GSF	Cost
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.			
5.1	Seed Lab		1,763			2,498	735	4,163		\$ 1,414,875
5.1.1	Receiving	040	94	1	182	182	88	60%	303	\$ 91,000
5.1.2	Purity Laboratory	054	546	1	484	484	-62	60%	807	\$ 302,500
5.1.3	Dividing Room	051	105	1	121	121	16	60%	202	\$ 75,625
5.1.4	Germination Laboratory	024	468	1	726	726	258	60%	1,210	\$ 453,750
5.1.5	Germinator/Growth Chamber Room	038	169	1	242	242	73	60%	403	\$ 141,167
5.1.6	Sample Storage	043, Trailer	240	1	363	363	123	60%	605	\$ 181,500
5.1.7	Director Office	027	141	1	140	140	-1	60%	233	\$ 65,333
5.1.8	Staff Area			4	60	240	240	60%	400	\$ 104,000
Subtotal - Seed Lab			1,763		2,498	735		4,163		\$ 1,414,875
6.0 PULSE LAB							Net-to-Gross	GSF	Cost/GSF	Cost
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.			
6.1	Pulse Lab		751			3,404	2,653	5,673		\$ 2,016,400
6.1.1	Sample Processing Laboratory	024	312	1	726	726	414	60%	1,210	\$ 387,200
6.1.2	Molecular Biology Laboratory	021	287	1	726	726	439	60%	1,210	\$ 484,000
6.1.3	Nematode Processing Laboratory			1	182	182	182	60%	303	\$ 121,333
6.1.4	Germinator/Growth Chamber Room	038	42	1	182	182	140	60%	303	\$ 121,333
6.1.5	Cold Room			1	121	121	121	60%	202	\$ 100,833
6.1.6	Laboratory Storage			1	121	121	121	60%	202	\$ 64,533
6.1.7	Greenhouse			1	484	484	484	60%	807	\$ 322,667
6.1.8	Headhouse			1	242	242	242	60%	403	\$ 141,167
6.1.9	Director Office	036	110	1	140	140	30	60%	233	\$ 65,333
6.1.10	Staff Area			8	60	480	480	60%	800	\$ 208,000
Subtotal - Pulse Lab			751		3,404	2,653		5,673		\$ 2,016,400

SUMMARY	Existing NSF	28,544	Proposed NSF	50,788	22,244	Prop. GSF	84,647	Const. Cost	\$ 34,162,200
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CONSTRUCTION COST SUMMARY	
Building Costs	
Building Construction	\$ 34,162,200
Contingency	
Design Contingency	10% \$ 3,416,220
Escalation from June 2018 to January 2021	
Annual Escalation Rate	4% \$ 3,871,325.11
Total Construction Cost	\$ 41,449,745
1. Construction Cost per GSF = \$ 489.68	
2. Not including FFE, AV, design fees, commissioning, testing	

PROJECT COST SUMMARY	
Project Costs	
Construction Cost	\$ 41,449,745
Project Associated Costs	25% \$ 10,362,436.28
Total Project Cost	\$ 51,812,181



OPTIONS

OPTION 1

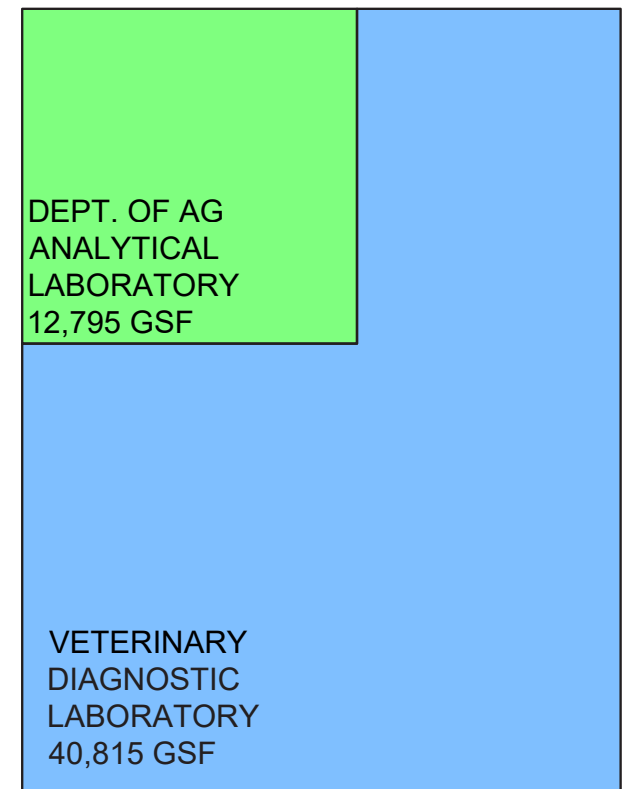
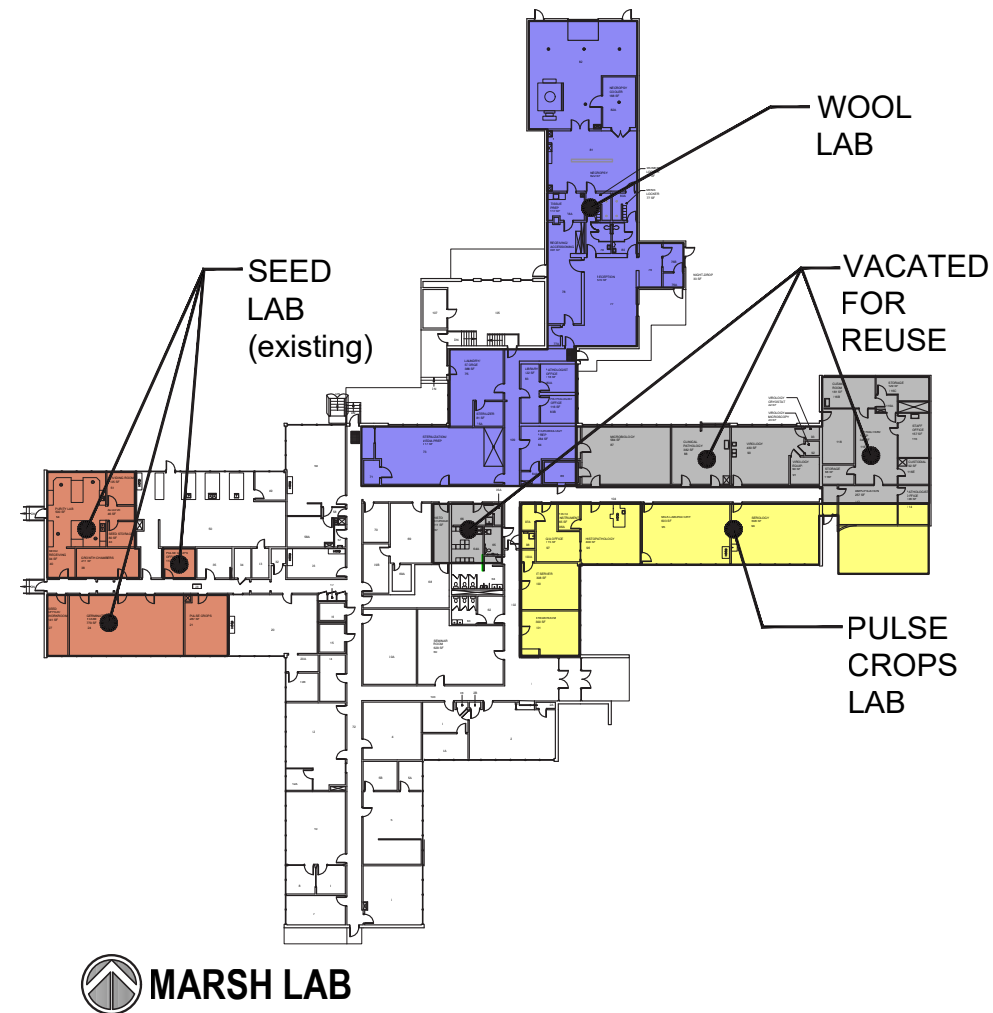
Option 1 provides a new building that will house the Department of Livestock Veterinary Diagnostic Laboratory and the Department of Agriculture Analytical Laboratory on a greenfield site followed by the renovation of the vacated space in the Marsh Laboratory Complex. The room list and gross square footage assumed for the new building is in accordance with the scope established in the Baseline Option. Several reductions in square footage from the Baseline Option are highlighted in the Option 1 room list. These reductions are achieved first by removing the VDL laboratory sections for Food Safety and DNA Sequencing which are services not currently offered by the organization. There are also additional slight reductions in VDL the overall VDL scope by decreasing the some of the projected growth in the BSL-3 Laboratory a well as the BSL-2 enhanced Necropsy. In addition, the breakroom space for the VDL and Analytical Lab has been combined. The overall scope of the new building to house the VDL and Analytical laboratories assumes a 60% net to gross ratio for a total of 53,610 gross square feet. The projected construction cost of the new building excluding site and utility costs is approximately \$505 per GSF.

Upon completion of the new facility, the roughly 11,500 net square feet vacated by the VDL in the Marsh Lab Facility will then be renovated to accommodate the Pulse Crops Laboratory and the Wool Laboratory. The combined net square footage requested by these two departments is 7,719 net square feet. If rooftop air handlers are allowed for the renovated areas of Marsh Lab, it is assumed that the floor plan layout will generally reuse existing restroom, mechanical, electrical and corridor spaces, achieving a net to gross ratio that is similar to what exists. A grossing factor of 68% has been shown for the renovation of Marsh Lab. Since the renovated Wool and Pulse Crops Laboratories will not take up the entirety of the space vacated by the VDL, there will be approximately 3,800 net square feet of vacated space left over that Montana State University can reclaim and use as it deems necessary. Similarly, McCall Hall will have been vacated for University reutilization. No costs for renovation of the vacated space in Marsh Lab or McCall Hall have been included in the Option 1 tabulation as this time. Upon completion of the renovation, the Seed Laboratory will then be allowed to grow into the space in the Marsh Laboratory complex vacated by the Pulse Crops Laboratory. This should alleviate any crowding issues for the Seed Lab and it is assumed that this can be done with little or no renovation in the west wing.

Under Option 1, the FWP Wildlife Laboratory will be unaffected.

The complete tabulation of all spaces, square footages, estimated costs per gross square foot and estimated soft costs for Option 1 (excluding site work and utilities) is shown on the following pages. The costs for new construction have been escalated to a mid-point of construction in the Winter of 2021. The costs for renovation in the Marsh Complex have been escalated to a mid-point of construction in the Winter of 2022 due to the fact that renovations in the Marsh Complex cannot commence until the Veterinary Diagnostic Laboratory has vacated the space. The total project cost for Option 1 is estimated to be approximately \$37,985,000.

Option 1



OPTION 1 FEATURES
 Veterinary Diagnostic Laboratory and Dept. of Ag Analytical Lab in New Building
 Wool Lab and Pulse Crops Lab in newly renovated space in Marsh Lab Complex
 Seed Lab expands into adjacent unrenovated space in Marsh Lab Complex
 FWP Wildlife Lab remains in present location
 10,500 net SF of space vacated for reuse in Marsh Lab Complex and McCall Hall
 Project Cost - \$37,985,471

OPTIONS

State of Montana Combined State Lab Study August 14, 2018	  	Option 1
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SPACE SUMMARY		Existing Area (Net)		Proposed Area (Net)		Proposed Area (Gross)		Estimated Cost			
New Building											
1.0 VETERINARY DIAGNOSTIC LAB											
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost
1.1	Receiving/Accessioning		424			1,210	786		2,017		\$ 670,542
1.1.1	Walk-In Samples			1	363	363	363	60%	605	\$ 300	\$ 181,500
1.1.2	Conference Room			0	242	0	0	60%	0	\$ 300	\$ -
1.1.3	Unisex Restroom			0	121	0	0	60%	0	\$ 350	\$ -
1.1.4	Delivery and Night Drop-Off Vestibule	076A	33	1	121	121	88	60%	202	\$ 325	\$ 65,542
1.1.5	Processing & Accessioning	078	391	1	726	726	335	60%	1,210	\$ 350	\$ 423,500
1.2	Necropsy & Prep		2,623			4,236	1,613		7,060		\$ 4,003,917
1.2.1	Necropsy Receiving	082	801	1	363	363	-438	60%	605	\$ 400	\$ 242,000
1.2.2	Live Animal Holding	082	115	1	363	363	248	60%	605	\$ 400	\$ 242,000
1.2.3	Tissue Trimming / Formalin Prep	078A	117	1	242	242	125	60%	403	\$ 450	\$ 181,500
1.2.4	BSL-2 Necropsy	081	622	1	726	726	104	60%	1,210	\$ 750	\$ 907,500
1.2.5	Evidence Storage	082	90	1	121	121	31	60%	202	\$ 400	\$ 80,667
1.2.6	Photography & Drug Storage			1	242	242	242	60%	403	\$ 400	\$ 161,333
1.2.7	Outgoing Cooler	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.8	Incoming Cooler w/ nightdrop	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.9	Lockers, Shower, Gowning & Boot Room	079A, 080A	330	1	1,089	1,089	759	60%	1,815	\$ 550	\$ 998,250
1.2.10	Necropsy Storage			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.2.11	Incinerator	082	360	1	484	484	124	60%	807	\$ 900	\$ 726,000
1.2.12	Formalin fixed storage		0	1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3	Laboratory Sections & Support		5,668			10,349	4,681		17,248		\$ 7,201,667
Clinical Pathology 1.3.1											
1.3.1.1	Clinical Pathology Laboratory	088	382	1	726	726	344	60%	1,210	\$ 400	\$ 484,000
1.3.1.2	Clinical Pathology Equipment Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.1.3	Clinical Pathology Microscopy Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
Histology 1.3.2											
1.3.2.1	Histology Laboratory	096	409	1	726	726	317	60%	1,210	\$ 400	\$ 484,000
1.3.2.2	Histology Equipment Room	096A	65	1	182	182	117	60%	303	\$ 350	\$ 106,167
1.3.2.3	Histology Slide/Block Storage	067, 97A	152	1	363	363	211	60%	605	\$ 350	\$ 211,750
Bacteriology 1.3.3											
1.3.3.1	Bacteriology Laboratory	087	584	1	726	726	142	60%	1,210	\$ 400	\$ 484,000
1.3.3.2	Bacteriology Dirty Room	084	284	1	121	121	-163	60%	202	\$ 400	\$ 80,667
1.3.3.3	Bacteriology Microscopy			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.3.4	Bacteriology Equipment	086	81	1	182	182	101	60%	303	\$ 350	\$ 106,167
Virology 1.3.4											
1.3.4.1	Virology Laboratory	090, 093	452	1	726	726	274	60%	1,210	\$ 400	\$ 484,000
1.3.4.2	Virology Fluorescent Microscopy	092	23	1	121	121	98	60%	202	\$ 400	\$ 80,667
1.3.4.3	Virology Equipment Room	091	90	1	182	182	92	60%	303	\$ 350	\$ 106,167
1.3.4.5	Virology Clean Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.4.6	Virology Dirty Room			1	182	182	182	60%	303	\$ 400	\$ 121,333
Serology 1.3.5											
1.3.5.1	Serology Laboratory	094	608	1	726	726	118	60%	1,210	\$ 400	\$ 484,000
1.3.5.2	Serology Centrifuge & Liquid Handling			1	182	182	182	60%	303	\$ 400	\$ 121,333
1.3.5.3	Serology Equipment Room			1	182	182	182	60%	303	\$ 350	\$ 106,167
Molecular Diagnostics 1.3.6											
1.3.6.1	Molecular Diagnostics Sample Prep			1	363	363	363	60%	605	\$ 400	\$ 242,000
1.3.6.2	Molecular Diagnostics Extraction	116	346	1	363	363	17	60%	605	\$ 400	\$ 242,000
1.3.6.3	Molecular Diagnostics Clean Room	116B	181	1	182	182	1	60%	303	\$ 400	\$ 121,333
1.3.6.4	Molecular Diagnostics Amplification	112	257	1	182	182	-76	60%	303	\$ 400	\$ 121,000
1.3.6.5	Molecular Diagnostics Freezer Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.6.6	Molecular Diagnostics Storage	116F	68	1	121	121	53	60%	202	\$ 350	\$ 70,583

SPACE SUMMARY		Existing Area (Net)		Proposed Area (Net)		Proposed Area (Gross)		Estimated Cost			
1.3.7 DNA Sequencing 1.3.7											
1.3.7.1	DNA Sequencing Laboratory Suite			0	726	0	0	60%	0	\$ 400	\$ -
Milk 1.3.8											
1.3.8.1	Milk Laboratory	095	603	1	1,089	1,089	486	60%	1,815	\$ 400	\$ 726,000
1.3.8.2	Milk Laboratory Equipment			1	363	363	363	60%	605	\$ 350	\$ 211,750
Food Safety 1.3.9											
1.3.9.1	Food Safety Laboratory			0	726	0	0	60%	0	\$ 400	\$ -
1.3.9.2	Food Safety Sterilization & Equipment			0	121	0	0	60%	0	\$ 600	\$ -
Shared Laboratory Support 1.3.10											
1.3.10.1	Sterilization, Glassware & Pure Water	73	717	1	726	726	9	60%	1,210	\$ 750	\$ 907,500
1.3.10.2	Media Prep Lab	073	100	1	121	121	21	60%	202	\$ 400	\$ 80,667
1.3.10.3	Biohazard Sterilization	075A	81	1	121	121	40	60%	202	\$ 750	\$ 151,250
1.3.10.4	Freezer Farm			1	242	242	242	60%	403	\$ 350	\$ 141,167
1.3.10.5	Hazardous Waste	082	115	1	242	242	127	60%	403	\$ 400	\$ 161,333
1.3.10.6	Laundry Room	075	70	1	121	121	51	60%	202	\$ 300	\$ 60,500
1.3.10.7	Chemical Storage			1	182	182	182	60%	303	\$ 400	\$ 121,000
1.4 Biocontainment											
				0		1,634	1,634		2,723		\$ 1,951,667
1.4.1	Lockers, Shower, Gowning & Boot Room			1	363	363	363	60%	605	\$ 550	\$ 332,750
1.4.2	Autoclave Sterilization			1	182	182	182	60%	303	\$ 650	\$ 197,167
1.4.3	Equipment Decontamination Airlock			1	121	121	121	60%	202	\$ 650	\$ 131,083
1.4.4	BSL-3 Laboratory			1	363	363	363	60%	605	\$ 800	\$ 484,000
1.4.5	BSL-3 Specialized Laboratory			2	121	242	242	60%	403	\$ 800	\$ 322,667
1.4.6	BSL-2 Enhanced Necropsy			1	363	363	363	60%	605	\$ 800	\$ 484,000
1.5 Office & Support											
				2,834		7,060	4,226		11,767		\$ 3,334,333
1.5.1	Reception and Waiting	077	570	1	800	800	230	60%	1,333	\$ 280	\$ 373,333
1.5.2	Director Office	083B	116	1	140	140	24	60%	233	\$ 280	\$ 65,333
1.5.3	Associate Director Office			1	120	120	120	60%	200	\$ 280	\$ 56,000
1.5.4	Administrative Conference Room			1	300	300	300	60%	500	\$ 280	\$ 140,000
1.5.5	Business Manager Office			1	120	120	120	60%	200	\$ 280	\$ 56,000
1.5.6	Quality Manager Office	097	215	1	120	120	-95	60%	200	\$ 280	\$ 56,000
1.5.7	Pathologist Office	083A, 114	256	4	120	480	224	60%	800	\$ 280	\$ 224,000
1.5.8	Open Office			25	60	1,500	1,500	60%	2,500	\$ 260	\$ 650,000
1.5.9	Library/Rounds Room	083	122	1	300	300	178	60%	500	\$ 280	\$ 140,000
1.5.10	Conference Room			2	120	240	240	60%	400	\$ 280	\$ 112,000
1.5.11	Multipurpose/Seminar Room	060	629	1	800	800	171	60%	1,333	\$ 300	\$ 400,000
1.5.12	Break Room	101	300	1	600	600	300	60%	1,000	\$ 300	\$ 300,000
1.5.13	Shipping			1	120	120	120	60%	200	\$ 300	\$ 60,000
1.5.14	Staff Lockers			1	300	300	300	60%	500	\$ 450	\$ 225,000
1.5.15	Storage	075	318	1	1,000	1,000	682	60%	1,667	\$ 250	\$ 416,667
1.5.16	Server Room	100	308	1	120	120	-188	60%	200	\$ 300	\$ 60,000
Subtotal - Veterinary Diagnostic Lab				11,549		24,489	12,940		40,815		\$ 17,162,125



OPTIONS

4.0 ANALYTICAL LAB											
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost
4.1	Laboratories & Support		5,055			6,414	1,359		10,690		\$ 4,552,333
	Feed & Fertilizer										
4.1.1	Feed/Fertilizer Sample Prep	001A, 001B	545	1	484	484	-61	60%	807	\$ 430	\$ 346,867
4.1.2	Feed/Fertilizer Sample Prep & Balance	012	216	1	242	242	26	60%	403	\$ 430	\$ 173,433
4.1.3	Feed/Fertilizer Chemistry Lab	019, 039	758	1	726	726	-32	60%	1,210	\$ 430	\$ 520,300
4.1.4	ICP Room	016, 016A	263	1	242	242	-21	60%	403	\$ 480	\$ 193,600
	Pesticide & Groundwater										
4.1.5	Pesticide Sample Prep	020	165	1	182	182	17	60%	303	\$ 430	\$ 130,433
4.1.6	Low-Level Pesticide/Groundwater Laboratory	001C	442	1	484	484	42	60%	807	\$ 430	\$ 346,867
4.1.7	Medium-Level Pesticide Laboratory	014	452	1	484	484	32	60%	807	\$ 430	\$ 346,867
4.1.8	High-Level Pesticide Laboratory	031	150	1	242	242	92	60%	403	\$ 480	\$ 193,600
4.1.9	Pesticide LCMS	024	248	1	484	484	236	60%	807	\$ 430	\$ 346,867
	Shared Space										
4.1.10	Feed/Fertilizer/Pesticide Lab	021, 038	649	1	726	726	77	60%	1,210	\$ 430	\$ 520,300
4.1.11	Feed/Pesticide GCMS	025	354	1	484	484	130	60%	807	\$ 480	\$ 387,200
4.1.12	Freezer/Standards Room	034	107	1	121	121	14	60%	202	\$ 430	\$ 86,717
4.1.13	Oven Room	038A	29	1	242	242	213	60%	403	\$ 480	\$ 193,600
4.1.14	Cooler Room	033	43	1	182	182	139	60%	303	\$ 430	\$ 130,433
4.1.15	Secured Sample Storage			1	121	121	121	60%	202	\$ 430	\$ 86,717
4.1.16	Hazardous Waste	032, 036	100	1	242	242	142	60%	403	\$ 430	\$ 173,433
4.1.17	Chemical Storage	013	195	1	242	242	47	60%	403	\$ 430	\$ 173,433
4.1.18	Receiving & Storage	001C	339	1	484	484	145	60%	807	\$ 250	\$ 201,667
4.2	Office & Support		1,653			1,263	-390		2,105		\$ 579,400
4.2.1	Receiving & Reception	010	367	1	363	363	-4	60%	605	\$ 280	\$ 169,400
4.2.2	Bureau Chief Office	009	215	1	140	140	-75	60%	233	\$ 280	\$ 65,333
4.2.3	Program Managers Office	011	161	1	140	140	-21	60%	233	\$ 280	\$ 65,333
4.2.4	Staff Office	023, 026	578	1	300	300	-278	60%	500	\$ 260	\$ 130,000
4.2.5	Office Work Room	010	111	1	120	120	9	60%	200	\$ 280	\$ 56,000
4.2.6	Conference Room			1	200	200	200	60%	333	\$ 280	\$ 93,333
4.2.7	Break Room	008	221	0	200	0	-221	60%	0	\$ 300	\$ -
	Subtotal - Analytical Lab		6,708			7,677	969		12,795		\$ 5,131,733

SUMMARY	Existing NSF	18,257	Proposed NSF	32,166	13,909	Prop. GSF	53,610	Const. Cost	\$22,293,858
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CONSTRUCTION COST SUMMARY (New Building)		
Building Costs		
Building Construction		\$ 22,293,858
Contingency		
Design Contingency	10%	\$ 2,229,386
Escalation from June 2018 to January 2021		
Annual Escalation Rate	4%	\$ 2,526,382.19
Construction Cost (New Building)		\$ 27,049,626
1. Construction Cost per GSF =		\$ 504.56
2. Not including FFE, AV, design fees, sitework, utilities, commissioning, testing		

Renovation in Marsh Lab Facility

2.0 WOOL LAB											
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost
2.1	Wool Lab		4,781			4,315	-466		6,346		\$ 1,157,007
2.1.1	Receiving Garage & Sample Storage	008, 010	1,563	1	1,452	1,452	-111	68%	2,135	\$ 100	\$ 213,529
2.1.2	Analytical Laboratory	102	292	1	363	363	71	68%	534	\$ 275	\$ 146,801
2.1.3	Wet Chemistry Laboratory	001, 003, 004	1,090	1	484	484	-606	68%	712	\$ 275	\$ 195,735
2.1.4	45-Person Classroom	101	458	1	908	908	450	68%	1,335	\$ 275	\$ 367,206
2.1.5	Director Office	107	157	1	140	140	-17	68%	206	\$ 150	\$ 30,882
2.1.6	Open Office	108	238	1	242	242	4	68%	356	\$ 150	\$ 53,382
2.1.7	Storage	002, 103, 105, Attic	825	1	726	726	-99	68%	1,068	\$ 140	\$ 149,471
2.1.8	Vacated Office	106	158	1	0	0	-158	68%	0	\$ -	\$ -
	Subtotal - Wool Lab		4,781			4,315	-466		6,346		\$ 1,157,007

6.0 PULSE LAB											
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost
6.1	Pulse Lab		751			3,404	2,653		5,006		\$ 1,373,860
6.1.1	Sample Processing Laboratory	024	312	1	726	726	414	68%	1,068	\$ 250	\$ 266,912
6.1.2	Molecular Biology Laboratory	021	287	1	726	726	439	68%	1,068	\$ 275	\$ 293,603
6.1.3	Nematode Processing Laboratory			1	182	182	182	68%	268	\$ 275	\$ 73,603
6.1.4	Germinator/Growth Chamber Room	038	42	1	182	182	140	68%	268	\$ 275	\$ 73,603
6.1.5	Cold Room			1	121	121	121	68%	178	\$ 400	\$ 71,176
6.1.6	Laboratory Storage			1	121	121	121	68%	178	\$ 275	\$ 48,934
6.1.7	Greenhouse			1	484	484	484	68%	712	\$ 400	\$ 284,706
6.1.8	Headhouse			1	242	242	242	68%	356	\$ 350	\$ 124,559
6.1.9	Director Office	036	110	1	140	140	30	68%	206	\$ 150	\$ 30,882
6.1.10	Staff Area			8	60	480	480	68%	706	\$ 150	\$ 105,882
	Subtotal - Pulse Lab		751			3,404	2,653		5,006		\$ 1,373,860

SUMMARY	Existing NSF	5,532	Proposed NSF	7,719	2,187	Prop. GSF	11,351	Const. Cost	\$2,530,868
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CONSTRUCTION COST SUMMARY (Renovation)		
Building Costs		
Building Construction		\$ 2,530,868
Contingency		
Design Contingency	15%	\$ 379,630
Escalation from June 2018 to January 2022		
Annual Escalation Rate	4%	\$ 428,252.67
Construction Cost (Renovation)		\$ 3,338,750
1. Construction Cost per GSF =		\$ 294.12
2. Not including FFE, AV, design fees, commissioning, testing		

TOTAL PROJECT COST SUMMARY		
Project Costs		
Construction Cost - New Building		\$ 27,049,626
Construction Cost - Renovation		\$ 3,338,750
Project Associated Costs	25%	\$ 7,597,094.21
Total Project Cost		\$ 37,985,471



OPTION 2

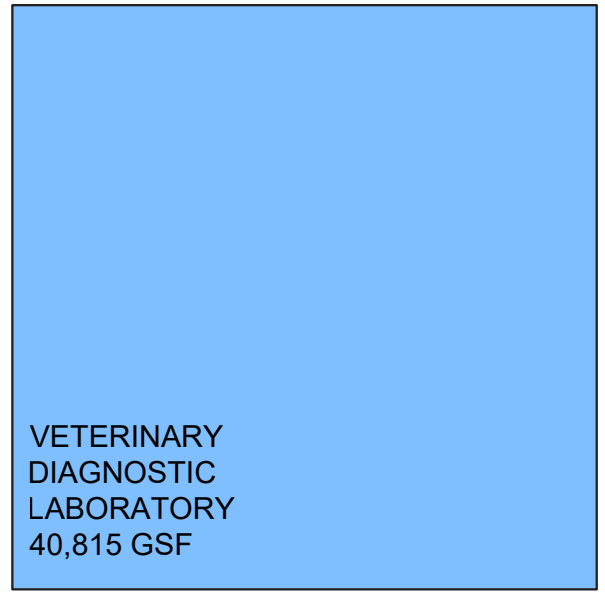
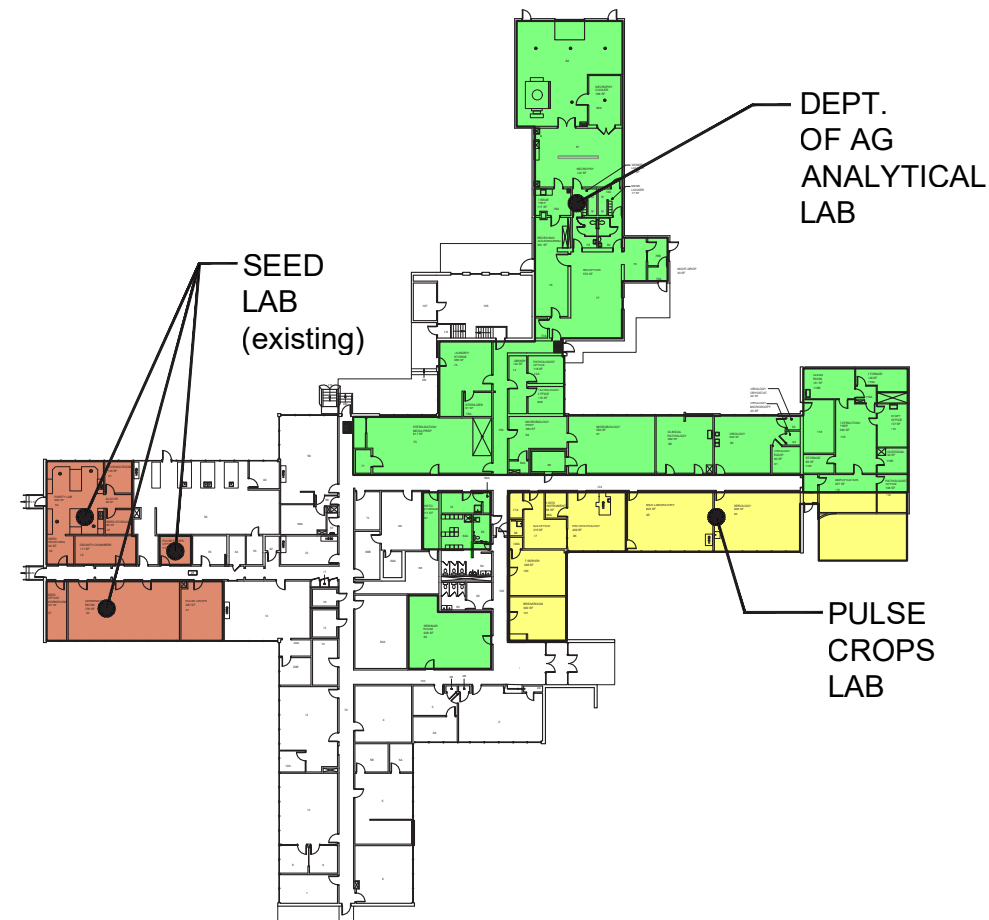
Option 2 provides a new building that will house only the Department of Livestock Veterinary Diagnostic Laboratory on a greenfield site followed by the renovation of its vacated space. Here again, the room list and gross square footage assumed for the new building is in accordance with the scope established in the Baseline Option and the reductions are similar to those shown in Option 1. The overall scope of the new building to solely house the VDL assumes a 60% net to gross ratio for a total of 40,815 gross square feet. The projected construction cost of the new building excluding site and utility costs is approximately \$510 per GSF.

Upon completion of the new facility, the space vacated by the VDL in the Marsh Lab Facility will then be renovated to accommodate the Pulse Crops Laboratory and the Analytical Laboratory. Under this scenario, the Wool Laboratory will remain in its present location. The combined net square footage requested by the Analytical Lab and the Pulse Crops Lab is 11,281 NSF. Similar to Option 1, a grossing factor of 68% has been shown for the renovation of Marsh Lab which assumes that rooftop air handlers will be allowed and that existing restroom, mechanical, electrical and corridor spaces will be generally reused in the current layout. In the case of Option 2, the renovation to accommodate the Analytical Lab and Pulse Crops Lab will take up all of the space vacated by the VDL, but McCall Hall will have been vacated for University reutilization. No costs for renovation of the vacated space in McCall Hall have been included in the Option 2 tabulation as this time. The Seed Laboratory will be allowed to grow into the space vacated by the Pulse Crops Laboratory similarly to the solution for Option 1.

Under Option 2, the FWP Wildlife Laboratory and the Wool Laboratory will be unaffected.

The complete tabulation of all spaces, square footages, estimated costs per gross square foot and estimated soft costs for Option 2 (excluding site work and utilities) is shown on the following pages. The costs for new construction have been escalated to a mid-point of construction in the Winter of 2021. The costs for renovation in the Marsh Complex have been escalated to a mid-point of construction in the Winter of 2022 due to the fact that renovations in the Marsh Complex cannot commence until the Veterinary Diagnostic Laboratory has vacated the space. The total project cost for Option 2 is estimated to be approximately \$33,354,000.

Option 2



NEW BUILDING

OPTION 2 FEATURES
 Veterinary Diagnostic Laboratory in New Building
 Dept. of Ag Analytical Lab and Pulse Crops Lab in newly renovated space in Marsh Lab Complex
 Seed Lab expands into adjacent unrenovated space in Marsh Lab Complex
 FWP Wildlife Lab remains in present location
 6,700 net SF of space vacated for reuse in McCall Hall
 Project Cost - \$33,354,253

OPTIONS

State of Montana
 Combined State Lab Study
 August 14, 2018

Option 2

SPACE SUMMARY		Existing Area (Net)		Proposed Area (Net)		Proposed Area (Gross)		Estimated Cost			
New Building											
1.0 VETERINARY DIAGNOSTIC LAB											
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost
1.1	Receiving/Accessioning		424			1,210	786		2,017		\$ 670,542
1.1.1	Walk-In Samples			1	363	363	363	60%	605	\$ 300	\$ 181,500
1.1.2	Conference Room			0	242	0	0	60%	0	\$ 300	\$ -
1.1.3	Unisex Restroom			0	121	0	0	60%	0	\$ 350	\$ -
1.1.4	Delivery and Night Drop-Off Vestibule	076A	33	1	121	121	88	60%	202	\$ 325	\$ 65,542
1.1.5	Processing & Accessioning	078	391	1	726	726	335	60%	1,210	\$ 350	\$ 423,500
1.2	Necropsy & Prep		2,623			4,236	1,613		7,060		\$ 4,003,917
1.2.1	Necropsy Receiving	082	801	1	363	363	-438	60%	605	\$ 400	\$ 242,000
1.2.2	Live Animal Holding	082	115	1	363	363	248	60%	605	\$ 400	\$ 242,000
1.2.3	Tissue Trimming / Formalin Prep	078A	117	1	242	242	125	60%	403	\$ 450	\$ 181,500
1.2.4	BSL-2 Necropsy	081	622	1	726	726	104	60%	1,210	\$ 750	\$ 907,500
1.2.5	Evidence Storage	082	90	1	121	121	31	60%	202	\$ 400	\$ 80,667
1.2.6	Photography & Drug Storage			1	242	242	242	60%	403	\$ 400	\$ 161,333
1.2.7	Outgoing Cooler	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.8	Incoming Cooler w/ nightdrop	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.9	Lockers, Shower, Gowning & Boot Room	079A, 080A	330	1	1,089	1,089	759	60%	1,815	\$ 550	\$ 998,250
1.2.10	Necropsy Storage			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.2.11	Incinerator	082	360	1	484	484	124	60%	807	\$ 900	\$ 726,000
1.2.12	Formalin fixed storage		0	1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3	Laboratory Sections & Support		5,668			10,349	4,681		17,248		\$ 7,201,667
Clinical Pathology 1.3.1											
1.3.1.1	Clinical Pathology Laboratory	088	382	1	726	726	344	60%	1,210	\$ 400	\$ 484,000
1.3.1.2	Clinical Pathology Equipment Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.1.3	Clinical Pathology Microscopy Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
Histology 1.3.2											
1.3.2.1	Histology Laboratory	096	409	1	726	726	317	60%	1,210	\$ 400	\$ 484,000
1.3.2.2	Histology Equipment Room	096A	65	1	182	182	117	60%	303	\$ 350	\$ 106,167
1.3.2.3	Histology Slide/Block Storage	067, 97A	152	1	363	363	211	60%	605	\$ 350	\$ 211,750
Bacteriology 1.3.3											
1.3.3.1	Bacteriology Laboratory	087	584	1	726	726	142	60%	1,210	\$ 400	\$ 484,000
1.3.3.2	Bacteriology Dirty Room	084	284	1	121	121	-163	60%	202	\$ 400	\$ 80,667
1.3.3.3	Bacteriology Microscopy			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.3.4	Bacteriology Equipment	086	81	1	182	182	101	60%	303	\$ 350	\$ 106,167
Virology 1.3.4											
1.3.4.1	Virology Laboratory	090, 093	452	1	726	726	274	60%	1,210	\$ 400	\$ 484,000
1.3.4.2	Virology Fluorescent Microscopy	092	23	1	121	121	98	60%	202	\$ 400	\$ 80,667
1.3.4.3	Virology Equipment Room	091	90	1	182	182	92	60%	303	\$ 350	\$ 106,167
1.3.4.5	Virology Clean Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.4.6	Virology Dirty Room			1	182	182	182	60%	303	\$ 400	\$ 121,333
Serology 1.3.5											
1.3.5.1	Serology Laboratory	094	608	1	726	726	118	60%	1,210	\$ 400	\$ 484,000
1.3.5.2	Serology Centrifuge & Liquid Handling			1	182	182	182	60%	303	\$ 400	\$ 121,333
1.3.5.3	Serology Equipment Room			1	182	182	182	60%	303	\$ 350	\$ 106,167
Molecular Diagnostics 1.3.6											
1.3.6.1	Molecular Diagnostics Sample Prep			1	363	363	363	60%	605	\$ 400	\$ 242,000
1.3.6.2	Molecular Diagnostics Extraction	116	346	1	363	363	17	60%	605	\$ 400	\$ 242,000
1.3.6.3	Molecular Diagnostics Clean Room	116B	181	1	182	182	1	60%	303	\$ 400	\$ 121,333
1.3.6.4	Molecular Diagnostics Amplification	112	257	1	182	182	-76	60%	303	\$ 400	\$ 121,000
1.3.6.5	Molecular Diagnostics Freezer Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.6.6	Molecular Diagnostics Storage	116F	68	1	121	121	53	60%	202	\$ 350	\$ 70,583
DNA Sequencing 1.3.7											
1.3.7.1	DNA Sequencing Laboratory Suite		0	0	726	0	0	60%	0	\$ 400	\$ -

SPACE SUMMARY		Existing Area (Net)		Proposed Area (Net)		Proposed Area (Gross)		Estimated Cost			
Milk 1.3.8											
1.3.8.1	Milk Laboratory	095	603	1	1,089	1,089	486	60%	1,815	\$ 400	\$ 726,000
1.3.8.2	Milk Laboratory Equipment			1	363	363	363	60%	605	\$ 350	\$ 211,750
Food Safety 1.3.9											
1.3.9.1	Food Safety Laboratory			0	726	0	0	60%	0	\$ 400	\$ -
1.3.9.2	Food Safety Sterilization & Equipment			0	121	0	0	60%	0	\$ 600	\$ -
Shared Laboratory Support 1.3.10											
1.3.10.1	Sterilization, Glassware & Pure Water	73	717	1	726	726	9	60%	1,210	\$ 750	\$ 907,500
1.3.10.2	Media Prep Lab	073	100	1	121	121	21	60%	202	\$ 400	\$ 80,667
1.3.10.3	Biohazard Sterilization	075A	81	1	121	121	40	60%	202	\$ 750	\$ 151,250
1.3.10.4	Freezer Farm			1	242	242	242	60%	403	\$ 350	\$ 141,167
1.3.10.5	Hazardous Waste	082	115	1	242	242	127	60%	403	\$ 400	\$ 161,333
1.3.10.6	Laundry Room	075	70	1	121	121	51	60%	202	\$ 300	\$ 60,500
1.3.10.7	Chemical Storage			1	182	182	182	60%	303	\$ 400	\$ 121,000
1.4	Biocontainment		0		1,634	1,634			2,723		\$ 1,951,667
1.4.1	Lockers, Shower, Gowning & Boot Room			1	363	363	363	60%	605	\$ 550	\$ 332,750
1.4.2	Autoclave Sterilization			1	182	182	182	60%	303	\$ 650	\$ 197,167
1.4.3	Equipment Decontamination Airlock			1	121	121	121	60%	202	\$ 650	\$ 131,083
1.4.4	BSL-3 Laboratory			1	363	363	363	60%	605	\$ 800	\$ 484,000
1.4.5	BSL-3 Specialized Laboratory			2	121	242	242	60%	403	\$ 800	\$ 322,667
1.4.6	BSL-2 Enhanced Necropsy			1	363	363	363	60%	605	\$ 800	\$ 484,000
1.5	Office & Support		2,834		7,060	4,226			11,767		\$ 3,334,333
1.5.1	Reception and Waiting	077	570	1	800	800	230	60%	1,333	\$ 280	\$ 373,333
1.5.2	Director Office	083B	116	1	140	140	24	60%	233	\$ 280	\$ 65,333
1.5.3	Associate Director Office			1	120	120	120	60%	200	\$ 280	\$ 56,000
1.5.4	Administrative Conference Room			1	300	300	300	60%	500	\$ 280	\$ 140,000
1.5.5	Business Manager Office			1	120	120	120	60%	200	\$ 280	\$ 56,000
1.5.6	Quality Manager Office	097	215	1	120	120	-95	60%	200	\$ 280	\$ 56,000
1.5.7	Pathologist Office	083A, 114	256	4	120	480	224	60%	800	\$ 280	\$ 224,000
1.5.8	Open Office			25	60	1,500	1,500	60%	2,500	\$ 260	\$ 650,000
1.5.9	Library/Rounds Room	083	122	1	300	300	178	60%	500	\$ 280	\$ 140,000
1.5.10	Conference Room			2	120	240	240	60%	400	\$ 280	\$ 112,000
1.5.11	Multipurpose/Seminar Room	060	629	1	800	800	171	60%	1,333	\$ 300	\$ 400,000
1.5.12	Break Room	101	300	1	600	600	300	60%	1,000	\$ 300	\$ 300,000
1.5.13	Shipping			1	120	120	120	60%	200	\$ 300	\$ 60,000
1.5.14	Staff Lockers			1	300	300	300	60%	500	\$ 450	\$ 225,000
1.5.15	Storage	075	318	1	1,000	1,000	682	60%	1,667	\$ 250	\$ 416,667
1.5.16	Server Room	100	308	1	120	120	-188	60%	200	\$ 300	\$ 60,000
Subtotal - Veterinary Diagnostic Lab		11,549		24,489		12,940		40,815		\$ 17,162,125	

SUMMARY	Existing NSF	11,549	Proposed NSF	24,489	12,940	Prop. GSF	40,815	Const. Cost	\$17,162,125
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CONSTRUCTION COST SUMMARY (New Building)	
Building Costs	
Building Construction	\$ 17,162,125
Contingency	
Design Contingency	10% \$ 1,716,213
Escalation from June 2018 to January 2021	
Annual Escalation Rate	4% \$ 1,944,844.46
Construction Cost (New Building)	\$ 20,823,182
1. Construction Cost per GSF = \$ 510.18	
2. Not including FFE, A/V, design fees, commissioning, testing	



OPTIONS

Renovation in Marsh Lab Facility

4.0 ANALYTICAL LAB							Net-to-Gross	GSF	Cost/GSF	Cost
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.			
4.1	Laboratories & Support		5,055			6,414	1,359		9,432	\$ 2,730,926
	Feed & Fertilizer									
4.1.1	Feed/Fertilizer Sample Prep	001A, 001B	545	1	484	484	-61	68%	712	\$ 202,853
4.1.2	Feed/Fertilizer Sample Prep & Balance	012	216	1	242	242	26	68%	356	\$ 101,426
4.1.3	Feed/Fertilizer Chemistry Lab	019, 039	758	1	726	726	-32	68%	1,068	\$ 320,294
4.1.4	ICP Room	016, 016A	263	1	242	242	-21	68%	356	\$ 113,882
	Pesticide & Groundwater									
4.1.5	Pesticide Sample Prep	020	165	1	182	182	17	68%	268	\$ 76,279
4.1.6	Low-Level Pesticide/Groundwater Laboratory	001C	442	1	484	484	42	68%	712	\$ 202,853
4.1.7	Medium-Level Pesticide Laboratory	014	452	1	484	484	32	68%	712	\$ 202,853
4.1.8	High-Level Pesticide Laboratory	031	150	1	242	242	92	68%	356	\$ 113,882
4.1.9	Pesticide LCMS	024	248	1	484	484	236	68%	712	\$ 227,765
	Shared Space									
4.1.10	Feed/Fertilizer/Pesticide Lab	021, 038	649	1	726	726	77	68%	1,068	\$ 304,279
4.1.11	Feed/Pesticide GCMS	025	354	1	484	484	130	68%	712	\$ 227,765
4.1.12	Freezer/Standards Room	034	107	1	121	121	14	68%	178	\$ 50,713
4.1.13	Oven Room	038A	29	1	242	242	213	68%	356	\$ 113,882
4.1.14	Cooler Room	033	43	1	182	182	139	68%	268	\$ 76,279
4.1.15	Secured Sample Storage			1	121	121	121	68%	178	\$ 50,713
4.1.16	Hazardous Waste	032, 036	100	1	242	242	142	68%	356	\$ 101,426
4.1.17	Chemical Storage	013	195	1	242	242	47	68%	356	\$ 101,426
4.1.18	Receiving & Storage	001C	339	1	484	484	145	68%	712	\$ 142,353
4.2	Office & Support		1,653			1,463	-190		2,151	\$ 337,426
4.2.1	Receiving & Reception	010	367	1	363	363	-4	68%	534	\$ 80,074
4.2.2	Bureau Chief Office	009	215	1	140	140	-75	68%	206	\$ 30,882
4.2.3	Program Managers Office	011	161	1	140	140	-21	68%	206	\$ 30,882
4.2.4	Staff Office	023, 026	578	1	300	300	-278	68%	441	\$ 66,176
4.2.5	Office Work Room	010	111	1	120	120	9	68%	176	\$ 26,471
4.2.6	Conference Room			1	200	200	200	68%	294	\$ 44,118
4.2.7	Break Room	008	221	1	200	200	-21	68%	294	\$ 58,824
	Subtotal - Analytical Lab		6,708			7,877	1,169		11,584	\$ 3,068,353

6.0 PULSE LAB							Net-to-Gross	GSF	Cost/GSF	Cost
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.			
6.1	Pulse Lab		751			3,404	2,653		5,006	\$ 1,373,860
6.1.1	Sample Processing Laboratory	024	312	1	726	726	414	68%	1,068	\$ 266,912
6.1.2	Molecular Biology Laboratory	021	287	1	726	726	439	68%	1,068	\$ 293,603
6.1.3	Nematode Processing Laboratory			1	182	182	182	68%	268	\$ 73,603
6.1.4	Germinator/Growth Chamber Room	038	42	1	182	182	140	68%	268	\$ 73,603
6.1.5	Cold Room			1	121	121	121	68%	178	\$ 50,713
6.1.6	Laboratory Storage			1	121	121	121	68%	178	\$ 50,713
6.1.7	Greenhouse			1	484	484	484	68%	712	\$ 202,853
6.1.8	Headhouse			1	242	242	242	68%	356	\$ 101,426
6.1.9	Director Office	036	110	1	140	140	30	68%	206	\$ 58,824
6.1.10	Staff Area			8	60	480	480	68%	706	\$ 193,544
	Subtotal - Pulse Lab		751			3,404	2,653		5,006	\$ 1,373,860

SUMMARY	Existing NSF	7,459	Proposed NSF	11,281	3,822	Prop. GSF	16,590	Const. Cost	\$4,442,213
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CONSTRUCTION COST SUMMARY (Renovation)	
Building Costs	
Building Construction	\$ 4,442,213
Contingency	
Design Contingency	15% \$ 666,332
Escalation from June 2018 to January 2022	
Annual Escalation Rate	4% \$ 751,674.91
Construction Cost (Renovation)	\$ 5,860,220
1. Construction Cost per GSF = \$ 353.24	
2. Not including FFE, AV, design fees, commissioning, testing	

TOTAL PROJECT COST SUMMARY	
Project Costs	
Construction Cost - New Building	\$ 20,823,182
Construction Cost - Renovation	\$ 5,860,220
Project Associated Costs	25% \$ 6,670,850.52
Total Project Cost	\$ 33,354,253



OPTION 3

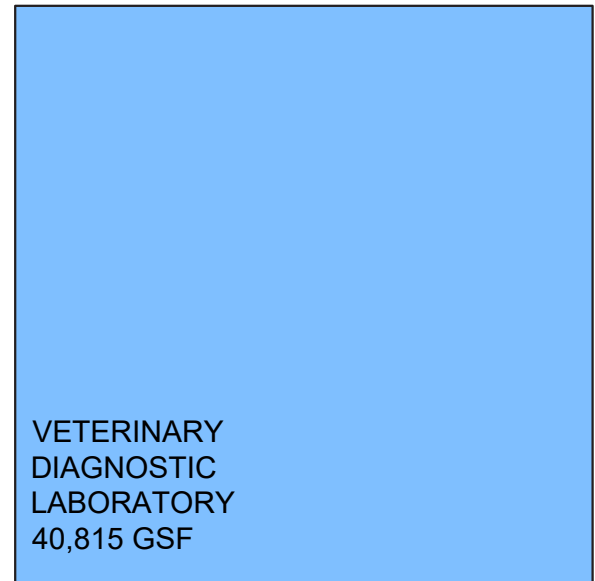
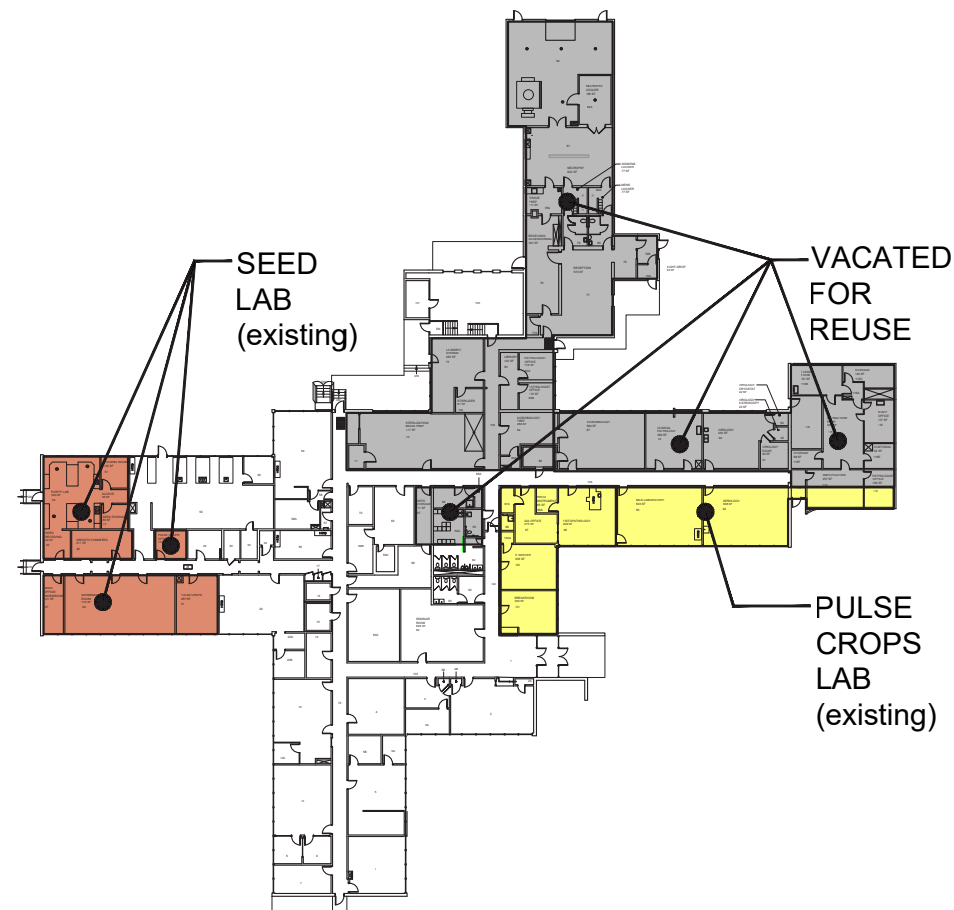
Option 3 provides a new building that will house only the Department of Livestock Veterinary Diagnostic Laboratory on a greenfield site and vacates the VDL portion of the Marsh Laboratory Complex with no additional renovations. Here again, the room list and gross square footage assumed for the new building is in accordance with the scope established in the Baseline Option and the reductions are similar to those shown in Option 1. The overall scope of the new building to solely house the VDL assumes a 60% net to gross ratio for a total of 40,815 gross square feet. The projected construction cost of the new building excluding site and utility costs is approximately \$510 per GSF.

Upon completion of the new facility, the space vacated by the VDL in the Marsh Lab Facility can be used to accommodate laboratory expansion by other existing tenants within the facility or by other programs with laboratory needs as the University sees fit. It is assumed that the Pulse Crops Lab will be able to expand into a portion of the space vacated by the VDL with little or no renovation to alleviate their cramped conditions. The Pulse Crops Lab will be able to reuse the existing lab space effectively without major renovation, but will not be provided with the programmed new greenhouse addition. Similarly to Options 1 and 2, the Seed Laboratory can expand into the space vacated by the Pulse Crops Lab with no planned renovation. After the Seed and Pulse Lab relocations, it is assumed that there will be approximately 8,600 net square feet of vacated space available for reuse.

Under Option 3, the FWP Wildlife Laboratory, Dept. of Ag. Analytical Lab and the Wool Lab will be unaffected.

The complete tabulation of all spaces, square footages, estimated costs per gross square foot and estimated soft costs for Option 3 (excluding site work and utilities) is shown on the following pages. The costs for new construction have been escalated to a mid-point of construction in the Winter of 2021. The total project cost for Option 3 is estimated to be approximately \$26,028,977.

Option 3



 **MARSH LAB**

NEW BUILDING

OPTION 3 FEATURES
 Veterinary Diagnostic Laboratory in New Building
 Pulse Crops Lab expands into unrenovated space in Marsh Lab Complex
 Seed Lab expands into adjacent unrenovated space in Marsh Lab Complex
 Dept. of Ag. Analytical Lab, Wool Lab and FWP Lab remain in present locations
 8,600 net SF of space vacated for reuse in Marsh Lab Complex
 Project Cost - \$26,028,977

OPTIONS

State of Montana
 Combined State Lab Study
 August 14, 2018



Option 3

SPACE SUMMARY		Existing Area (Net)	Proposed Area (Net)			Proposed Area (Gross)	Estimated Cost				
New Building											
1.0 VETERINARY DIAGNOSTIC LAB											
Number	Area	Room No.	NSF	Qty	NSF Ea.	NSF	NSF Diff.	Net-to-Gross	GSF	Cost/GSF	Cost
1.1	Receiving/Accessioning		424			1,210	786		2,017		\$ 670,542
1.1.1	Walk-In Samples			1	363	363	363	60%	605	\$ 300	\$ 181,500
1.1.2	Conference Room			0	242	0	0	60%	0	\$ 300	\$ -
1.1.3	Unisex Restroom			0	121	0	0	60%	0	\$ 350	\$ -
1.1.4	Delivery and Night Drop-Off Vestibule	076A	33	1	121	121	88	60%	202	\$ 325	\$ 65,542
1.1.5	Processing & Accessioning	078	391	1	726	726	335	60%	1,210	\$ 350	\$ 423,500
1.2	Necropsy & Prep		2,623			4,236	1,613		7,060		\$ 4,003,917
1.2.1	Necropsy Receiving	082	801	1	363	363	-438	60%	605	\$ 400	\$ 242,000
1.2.2	Live Animal Holding	082	115	1	363	363	248	60%	605	\$ 400	\$ 242,000
1.2.3	Tissue Trimming / Formalin Prep	078A	117	1	242	242	125	60%	403	\$ 450	\$ 181,500
1.2.4	BSL-2 Necropsy	081	622	1	726	726	104	60%	1,210	\$ 750	\$ 907,500
1.2.5	Evidence Storage	082	90	1	121	121	31	60%	202	\$ 400	\$ 80,667
1.2.6	Photography & Drug Storage			1	242	242	242	60%	403	\$ 400	\$ 161,333
1.2.7	Outgoing Cooler	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.8	Incoming Cooler w/ nightdrop	082A	94	1	182	182	88	60%	303	\$ 500	\$ 151,667
1.2.9	Lockers, Shower, Gowning & Boot Room	079A, 080A	330	1	1,089	1,089	759	60%	1,815	\$ 550	\$ 998,250
1.2.10	Necropsy Storage			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.2.11	Incinerator	082	360	1	484	484	124	60%	807	\$ 900	\$ 726,000
1.2.12	Formalin fixed storage		0	1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3	Laboratory Sections & Support		5,668			10,349	4,681		17,248		\$ 7,201,667
Clinical Pathology 1.3.1											
1.3.1.1	Clinical Pathology Laboratory	088	382	1	726	726	344	60%	1,210	\$ 400	\$ 484,000
1.3.1.2	Clinical Pathology Equipment Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.1.3	Clinical Pathology Microscopy Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
Histology 1.3.2											
1.3.2.1	Histology Laboratory	096	409	1	726	726	317	60%	1,210	\$ 400	\$ 484,000
1.3.2.2	Histology Equipment Room	096A	65	1	182	182	117	60%	303	\$ 350	\$ 106,167
1.3.2.3	Histology Slide/Block Storage	067, 97A	152	1	363	363	211	60%	605	\$ 350	\$ 211,750
Bacteriology 1.3.3											
1.3.3.1	Bacteriology Laboratory	087	584	1	726	726	142	60%	1,210	\$ 400	\$ 484,000
1.3.3.2	Bacteriology Dirty Room	084	284	1	121	121	-163	60%	202	\$ 400	\$ 80,667
1.3.3.3	Bacteriology Microscopy			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.3.4	Bacteriology Equipment	086	81	1	182	182	101	60%	303	\$ 350	\$ 106,167
Virology 1.3.4											
1.3.4.1	Virology Laboratory	090, 093	452	1	726	726	274	60%	1,210	\$ 400	\$ 484,000
1.3.4.2	Virology Fluorescent Microscopy	092	23	1	121	121	98	60%	202	\$ 400	\$ 80,667
1.3.4.3	Virology Equipment Room	091	90	1	182	182	92	60%	303	\$ 350	\$ 106,167
1.3.4.4	Virology Clean Room			1	121	121	121	60%	202	\$ 400	\$ 80,667
1.3.4.5	Virology Dirty Room			1	182	182	182	60%	303	\$ 400	\$ 121,333
Serology 1.3.5											
1.3.5.1	Serology Laboratory	094	608	1	726	726	118	60%	1,210	\$ 400	\$ 484,000
1.3.5.2	Serology Centrifuge & Liquid Handling			1	182	182	182	60%	303	\$ 400	\$ 121,333
1.3.5.3	Serology Equipment Room			1	182	182	182	60%	303	\$ 350	\$ 106,167
Molecular Diagnostics 1.3.6											
1.3.6.1	Molecular Diagnostics Sample Prep			1	363	363	363	60%	605	\$ 400	\$ 242,000
1.3.6.2	Molecular Diagnostics Extraction	116	346	1	363	363	17	60%	605	\$ 400	\$ 242,000
1.3.6.3	Molecular Diagnostics Clean Room	116B	181	1	182	182	1	60%	303	\$ 400	\$ 121,333
1.3.6.4	Molecular Diagnostics Amplification	112	257	1	182	182	-76	60%	303	\$ 400	\$ 121,000
1.3.6.5	Molecular Diagnostics Freezer Room			1	121	121	121	60%	202	\$ 350	\$ 70,583
1.3.6.6	Molecular Diagnostics Storage	116F	68	1	121	121	53	60%	202	\$ 350	\$ 70,583
DNA Sequencing 1.3.7											
1.3.7.1	DNA Sequencing Laboratory Suite			0	726	0	0	60%	0	\$ 400	\$ -
Milk 1.3.8											
1.3.8.1	Milk Laboratory	095	603	1	1,089	1,089	486	60%	1,815	\$ 400	\$ 726,000
1.3.8.2	Milk Laboratory Equipment			1	363	363	363	60%	605	\$ 350	\$ 211,750

SPACE SUMMARY		Existing Area (Net)	Proposed Area (Net)			Proposed Area (Gross)	Estimated Cost				
Food Safety 1.3.9											
1.3.9.1	Food Safety Laboratory		0	726	0	0	60%	0	\$ 400	\$ -	
1.3.9.2	Food Safety Sterilization & Equipment		0	121	0	0	60%	0	\$ 600	\$ -	
Shared Laboratory Support 1.3.10											
1.3.10.1	Sterilization, Glassware & Pure Water	73	717	1	726	726	9	60%	1,210	\$ 750	\$ 907,500
1.3.10.2	Media Prep Lab	073	100	1	121	121	21	60%	202	\$ 400	\$ 80,667
1.3.10.3	Biohazard Sterilization	075A	81	1	121	121	40	60%	202	\$ 750	\$ 151,250
1.3.10.4	Freezer Farm			1	242	242	242	60%	403	\$ 350	\$ 141,167
1.3.10.5	Hazardous Waste	082	115	1	242	242	127	60%	403	\$ 400	\$ 161,333
1.3.10.6	Laundry Room	075	70	1	121	121	51	60%	202	\$ 300	\$ 60,500
1.3.10.7	Chemical Storage			1	182	182	182	60%	303	\$ 400	\$ 121,000
1.4	Biocontainment		0		1,634	1,634			2,723		\$ 1,951,667
1.4.1	Lockers, Shower, Gowning & Boot Room			1	363	363	363	60%	605	\$ 550	\$ 332,750
1.4.2	Autoclave Sterilization			1	182	182	182	60%	303	\$ 650	\$ 197,167
1.4.3	Equipment Decontamination Airlock			1	121	121	121	60%	202	\$ 650	\$ 131,083
1.4.4	BSL-3 Laboratory			1	363	363	363	60%	605	\$ 800	\$ 484,000
1.4.5	BSL-3 Specialized Laboratory			2	121	242	242	60%	403	\$ 800	\$ 322,667
1.4.6	BSL-2 Enhanced Necropsy			1	363	363	363	60%	605	\$ 800	\$ 484,000
1.5	Office & Support		2,834			7,060	4,226		11,767		\$ 3,334,333
1.5.1	Reception and Waiting	077	570	1	800	800	230	60%	1,333	\$ 280	\$ 373,333
1.5.2	Director Office	083B	116	1	140	140	24	60%	233	\$ 280	\$ 65,333
1.5.3	Associate Director Office			1	120	120	120	60%	200	\$ 280	\$ 56,000
1.5.4	Administrative Conference Room			1	300	300	300	60%	500	\$ 280	\$ 140,000
1.5.5	Business Manager Office			1	120	120	120	60%	200	\$ 280	\$ 56,000
1.5.6	Quality Manager Office	097	215	1	120	120	-95	60%	200	\$ 280	\$ 56,000
1.5.7	Pathologist Office	083A, 114	256	4	120	480	224	60%	800	\$ 280	\$ 224,000
1.5.8	Open Office			25	60	1,500	1,500	60%	2,500	\$ 260	\$ 650,000
1.5.9	Library/Rounds Room	083	122	1	300	300	178	60%	500	\$ 280	\$ 140,000
1.5.10	Conference Room			2	120	240	240	60%	400	\$ 280	\$ 112,000
1.5.11	Multipurpose/Seminar Room	060	629	1	800	800	171	60%	1,333	\$ 300	\$ 400,000
1.5.12	Break Room	101	300	1	600	600	300	60%	1,000	\$ 300	\$ 300,000
1.5.13	Shipping			1	120	120	120	60%	200	\$ 300	\$ 60,000
1.5.14	Staff Lockers			1	300	300	300	60%	500	\$ 450	\$ 225,000
1.5.15	Storage	075	318	1	1,000	1,000	682	60%	1,667	\$ 250	\$ 416,667
1.5.16	Server Room	100	308	1	120	120	-188	60%	200	\$ 300	\$ 60,000
Subtotal - Veterinary Diagnostic Lab			11,549		24,489	12,940			40,815		\$ 17,162,125

SUMMARY	Existing NSF	11,549	Proposed NSF	24,489	12,940	Prop. GSF	40,815	Const. Cost	\$17,162,125
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CONSTRUCTION COST SUMMARY (New Building)	
Building Costs	
Building Construction	\$ 17,162,125
Contingency	
Design Contingency	10% \$ 1,716,213
Escalation from June 2018 to January 2021	
Annual Escalation Rate	4% \$ 1,944,844.46
Construction Cost (New Building)	\$ 20,823,182
1. Construction Cost per GSF = \$ 510.18	
2. Not including FFE, AV, design fees, commissioning, testing	

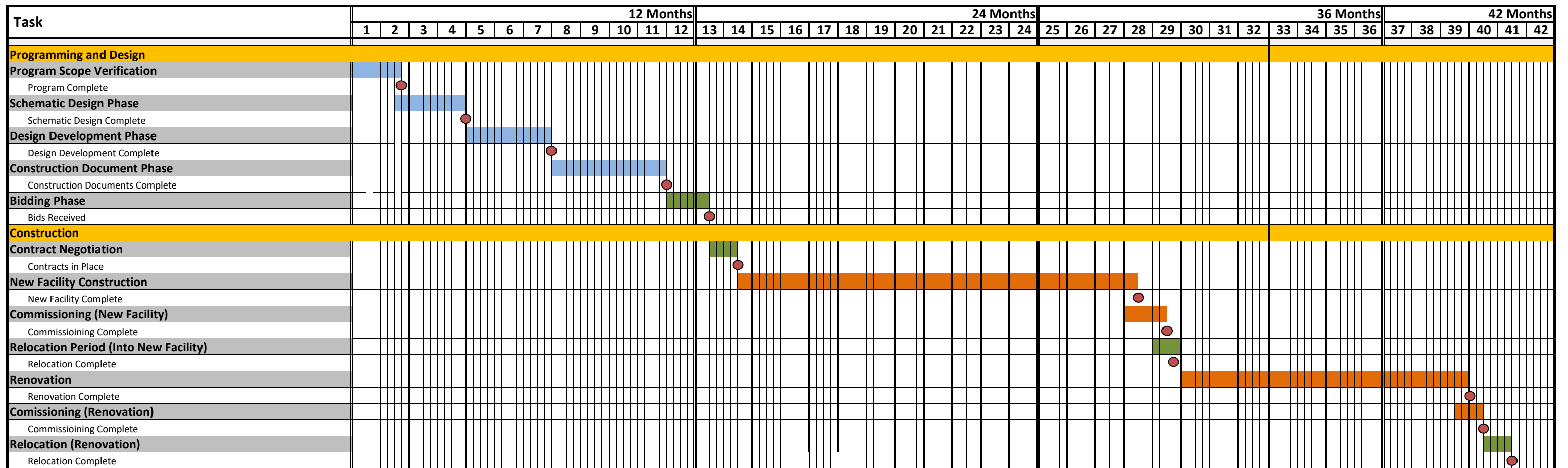
TOTAL PROJECT COST SUMMARY	
Project Costs	
Construction Cost - New Building	\$ 20,823,182
Project Associated Costs	25% \$ 5,205,795.49
Total Project Cost	\$ 26,028,977
2. Not including FFE, AV, design fees, commissioning, testing	



DESIGN AND CONSTRUCTION SCHEDULE

DESIGN AND CONSTRUCTION SCHEDULE

The graphic below shows the proposed design and construction schedule assuming a conventional design, bid, build delivery approach. It is estimated that the design and construction associated with Options 1 and 2 will take approximately 40 months from the time that a design firm is engaged and receives the notice to proceed. Under Option 3, the overall schedule can be reduced by 10 to 14 months as there would be no renovations to the Marsh Laboratory Complex and the design schedule could potentially be accelerated slightly.



ARCHITECTURAL SYSTEMS NARRATIVE

ARCHITECTURAL SYSTEMS NARRATIVE

Design, construction and/or renovation of all elements proposed in this program should be subject to the codes and standards listed below. While it is recognized that the codes and standards listed are minimum, nothing is to prevent the architect, engineer or consultant from exceeding the applicable requirements, if it is considered prudent design. In all cases, the most recent editions of referenced standards apply.

Applicable Codes and Standards

- International Building Code (IBC)
- International Mechanical Code (IMC)
- International Plumbing Code (IPC)
- National Electrical Code (NEC)
- National Fire Protection Association (NFPA 101, NFPA 45, NFPA 30)
- Americans with Disabilities Act Accessibility Guidelines (ADA-AG)
- American National Standard Institute (ANSI 117.1)
- American Concrete Institute (ACI-318)
- Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

The codes and standards listed above ensure that at a minimum, fire and life safety are provided to occupants of the building. In addition, standards established by the State of Montana and Montana State University shall also be followed.

New construction associated with elements of this program will likely be classified as Business Group B (IBC Section 304, 304.1). Group S occupancies shall also be included and analysis of the potential need for Group H occupancy shall be evaluated as part of the design process. The building will be classified as a Type I or Type II construction classification as determined by the International Building Code.

Any additions or renovations to existing facilities should be analyzed to determine the appropriate fire separation between existing and new construction based on allowable building area under the chosen construction type. It will also be prudent to investigate the suitability of designating all laboratory spaces as Class 'B' under the NFPA 45. If this designation is pursued, it will call for all laboratories to be separated from each other and other portions of the building by not less than a one-hour fire resistive occupancy separation with 45-minute openings. Exit enclosures will be separated from other portions of the building in accordance with IBC Section 707.4. Fire resistance ratings of structural elements and exterior walls should comply with Table 601 and Table 602 respectively, of the International Building Code as determined by the building construction type

classification. The quantities of hazardous materials stored shall not exceed those listed in Tables 307.7(1) of the International Building Code, and any area determined to be hazardous shall be protected in accordance with the separation/protection as described in Table 12-3.2.1 of the NFPA 101 Life Safety Code. Laboratories and administrative areas shall be separated from potentially hazardous material storage areas in accordance with Table 302.3.3 of the International Building Code. Occupants in laboratories having an area in excess of 200 square feet shall have access to at least two exits from the room. Additional exiting requirements are outlined in Chapter 10 of the International Building Code and NFPA 45 (Fire Protection for Laboratories Using Chemicals).

The height and area limitations of any new construction should be evaluated in accordance with Table 503 of the International Building Code with area and height modifications for public way frontage and automatic sprinkler systems taken into account. It is not anticipated, but if new construction is in excess of 75 feet, then the provisions of IBC Section 403, "High-Rise Buildings" shall apply. Where an on-grade exit is not immediately accessible from an open floor area, safe and continuous corridors or passageways shall be maintained leading directly to an exit and shall be arranged to provide convenient access for each occupant to at least two exits by separate ways of travel. The minimum width of any corridor or passageway serving as a required exit, exit access or exit discharge shall be 44 inches in the clear. It is generally assumed that the design and construction of any new construction shall include an approved automatic sprinkler system throughout all portions of the building. Associated area and height increases allowed by the code shall be incorporated in all calculations.

The preparation of this program and tabulation of appropriate spatial designations adheres to the concepts for laboratory modular planning. Modular means "constructed with standardized units or dimensions for flexibility and a variety of uses". Modular planning is used as an organizational tool to allocate space within the building, establishing a grid by which walls, partitions and structural elements are located. As alterations in use are required because of changes in laboratory techniques and building organization, partitions can be relocated, doors moved, and areas of the building expanded or modified without requiring reconstruction of structural or mechanical building elements. The definition of module also includes the organized and systematic delivery of piped services, HVAC ducts, power and data cabling. If these services are delivered to each area of the building in a consistent manner, then changes in use requiring addition or deletion of services are accomplished more easily because of the constant nature of the infrastructure. This also allows changes and retrofit to one area with minimal disruption to adjacent spaces or to spaces above and below (as applicable). Building piped service mains should be looped and zoned to allow for segments to be isolated, thus allowing repair, maintenance and alteration without affecting adjacent units.

ARCHITECTURAL SYSTEMS NARRATIVE

ARCHITECTURAL SYSTEMS NARRATIVE CONT.

The module for this program was derived by analyzing the various laboratory organizations and necropsy spaces in conjunction with their diagnostic and service laboratory missions, optimal laboratory safety and instrumentation requirements. The module is based on many factors such as laboratory bench space, efficient office spaces and specialized support spaces. A building module of 11'-0" in width by 33'-0" in length is recommended for the planning phase. Although this represents the typical configurations for laboratories contained in this program, the flexible nature of the module will allow for additional diverse arrangements. Exact layout of laboratory modules will be reviewed, explored and finalized through additional meetings with section leaders and laboratory staff throughout the later phases of design.

General information related to the module configuration recommended is as follows: Peninsula benches which are 5'-6" deep and wall benches 2'-9" deep are recommended to accommodate the anticipated instrumentation to be used in many of the testing laboratories. A 5'-0" wide aisle between benches will minimize conflicts between personnel and reduce potential safety hazards. It is especially critical in all laboratory spaces that carts are able to maneuver without conflict in all aisles. This also complies with ADAAG requirements regarding accessibility. An 11'-0" module in width (approximately 10'-6" clear between wall surfaces) will accommodate the above requirements and will provide sufficient space in laboratories when movable computer stations or equipment racks are used near laboratory benches. The length of the module is based on the need to provide adequate equipment space in diagnostic laboratories. The module size is based on the minimum criteria required to ascertain that all proper functional working relationships and safety requirements are met. The laboratories resulting from the establishment of this module are easily adaptable as technology and testing procedures change in the future. In addition to laboratory planning, the 11'-0" x 33'-0" module has also been used where appropriate for layout of administrative and support areas.

With a singular module for the entire building, the design can be integrated for all building areas with structural, mechanical and electrical systems and services. Although a singular module is preferred for the building, certain deviations are acceptable where appropriate to meet specific programmatic needs. Exact building configuration will be established in the schematic and design development phases of the project.

Effective circulation is an important element in the design of new or renovated laboratory space. The design must be organized to allow for a high level of interaction among various laboratory groups while providing a high level of security to control public access both into the building and into the various laboratory components of the facility. Ideally, the building should be security

zoned to allow optimal access to public areas while offering restricted access to the more sensitive laboratory areas where bio-security, chemical hazards and chain of custody is a concern. Internal building circulation should provide for safe pedestrian egress from each individual area and support space through an uncomplicated path of egress to the building exterior at grade. Other features that should be considered in the design of the circulation system include the following:

At least one door into each laboratory space should provide for a 42" minimum opening. This can be accomplished using a single 3'-6" wide door. Equipment lists should be carefully reviewed to verify that individual pieces of equipment can be transported and delivered between spaces. Interior circulation corridors should also be wide enough to accommodate the largest potential equipment as well as two-way simultaneous cart traffic. Doorways accessing corridors should open into recessed alcoves serving the corridor. The doors should swing out from laboratories in the direction of exit egress.

Circulation and fume hood locations within laboratory spaces should be arranged to preclude passing in front of fume hoods or other containment devices when exiting. To accommodate multiple exits in laboratory spaces, "ghost corridors" or secondary means of egress through adjacent laboratories should be considered. This second door between labs provides required exiting and can encourage interaction and sharing of resources between diagnostic sections where appropriate. Laboratory core facilities should be located such that all lab sections have equal and shared access. Exit stairs and roof access shall be provided to meet all code requirements and direct exiting to the exterior will be provided where required by code.

New construction and renovations must conform to Federal, State and Local statutes on accessibility standards. These standards must apply in all aspects of the project design including site, building and laboratory design.

The final design should address the issue of cleanliness in several ways. Surfaces should be washable and durable. Adequate storage for cleaning supplies and equipment should be provided in at least one location on each floor. In addition to the provision for a bio-hazard incinerator, accommodations for trash and hazardous waste containment, removal, and eventual disposal should be made. Each level in the building should be provided with a custodial space to service the floor. The space provided should accommodate a reasonable store of routinely used cleaning equipment and supplies.

ARCHITECTURAL SYSTEMS NARRATIVE

ARCHITECTURAL SYSTEMS NARRATIVE CONT.

The choice of finish materials, particularly for floors, should take into account the expectation of heavy usage and regular cleaning. Maintainability is an issue that should dominate the selection of the building's interior finish materials. The choice of flooring materials should be based on a careful examination of the costs and wearability associated with the maintenance of the material over the period of its anticipated use. Soft surfaces chosen should be antistatic, antibacterial, neutral in color, and easily removed and repaired. It is desirable to maintain a modest number of different materials in the facility to simplify stocking and matching of replacement pieces. If it is decided that environmentally sensitive materials are chosen for the building, they should be evaluated in accordance with both "green" issues and lifecycle cost.

Emergency eyewashes and showers will be provided for the laboratories. The design should meet the applicable ANSI standard. Tempering valves will be provided and the emergency fixtures will be fed with tempered water. Valves will be located in an accessible location to allow for maintenance. A key goal for the project is to provide adequate facilities for the safe handling of potentially pathogenic biological samples and hazardous chemicals. Where applicable, the design of all areas that may be used for work with biological pathogens will adhere strictly to the minimum requirements for BSL-2 or BSL-3 compliance in accordance with the federal standards published by the NIH and CDC. In addition to specific protocols employed in these spaces, the facility itself plays a crucial role in providing a suitable working environment. These features include hard, durable surfaces that will stand up to potent disinfectants, non-recirculating air handling systems, casework and furnishings that meet or exceed the requirements of SEFA, dedicated non-potable laboratory plumbing systems, proper containment devices and specific laboratory safety equipment such as eye washes and safety showers.

In addition to specific finishes and engineered systems, the architectural layout of a well-designed laboratory plays a critical role in providing laboratory safety and flexibility. Laboratory benches should be of adequate size to provide work space that can be used for multiple functions likely to take place such as organizing and labeling large amounts of samples, preparing materials for centrifuging, pipetting and storage as well as cleaning field equipment. These bench areas will also allow for the placement of a host of laboratory bench top equipment such as analytical instrumentation, centrifuges, sterilizers, water baths, hot plates and microscopes. Similarly, adequate, flexible floor standing space will be provided for the placement of refrigerators, freezers, incubators, and, when called for, containment devices such as biological safety cabinets and glove boxes.

The laboratory will be organized around the concept of modular laboratory planning where benches are generally 5'-6" wide and spaces apart on 11'-0" centers to provide a minimum of 5'-0" clear between countertops. Finish materials in the laboratory will include steel laboratory casework, epoxy or phenolic resin countertops, seamless flooring, cleanable ceiling tile and semi-gloss epoxy paint systems.

Interior finishes employed in the north and west addition will meet the minimum requirements in accordance with university guidelines and should provide durable, cleanable finishes throughout. Walls in most areas can be drywall with a painted surface. Offices and low traffic areas can utilize standard latex paints in accordance with university guidelines, but any rooms that may be used for handling biological and chemical materials should receive an epoxy based primer and paint with gloss or semi-gloss finish. Walls in the new locker room will be concrete masonry to create the hardened storm shelter and can be finished with block filler and paint or could receive a tile finish if desired.

Flooring in laboratories and corridors serving laboratory areas should be of seamless construction. This can be provided by a seamless vinyl system with heat welded joints, but a troweled or broadcast epoxy will be more suitable and require less maintenance. Floors in spaces such as administrative and conference spaces can be provided with vinyl composition tile and rubber base, but an epoxy finish could be considered for these areas as well.

ENGINEERED SYSTEMS NARRATIVE

ENGINEERED SYSTEMS NARRATIVE

MECHANICAL

The electrical design for this project will include the following:

The mechanical design for this project will include the following upgrades to systems within Marsh Lab and new systems for the New Building. All upgraded and new systems will be code-compliant, safe, flexible, and energy-efficient.

HVAC

In all options, multiple new 100% outside air modular-type air handling units (AHU) will be installed either in the penthouse or on the roof and they will serve new and renovated area. Each AHU will include fan arrays, heating water coils, chilled water coils, heat recovery coils, and filtration.

New heat recovery housing and plenum fan array systems will be provided in the penthouse or on the roof. The exhaust fans will have variable frequency drives. The heat recovery plenum components will consist of a 35% efficient filter bank followed by a heat recovery coil bank. The coils will utilize a 40% propylene glycol / 60% water mixture as the heat transfer fluid. A small pump will circulate the fluid between the exhaust heat recovery coils and the AHU heat recovery coils.

A variable air volume (VAV) air distribution system will be utilized. Each temperature control zone will be served by a supply VAV box with an integral reheat coil. The VAV box will modulate its damper position to provide only enough airflow to maintain the room setpoint temperature while simultaneously ensuring the required minimum ventilation rates to each zone are maintained. To the extent possible, each VAV box will be located in the penthouse mechanical space or in an accessible area for improved maintenance access. The exhaust system will operate in a VAV mode similar to the supply air system.

Chilled water pumps, steam-to-heating water converters, heating water pumps, heat recovery pumps, and steam humidifiers will be installed and will provide building cooling, heating, and humidification needs. Steam and condensate will also be piped to applicable laboratory equipment such as autoclaves.

New direct digital controls (DDC) will be provided for the building automation system (BAS). The BAS will have the capability to adjust setpoints and system operation to match changing facility functions.

PLUMBING

New water service, including backflow preventer, meter, and associated valves, will be provided for the New Building. Natural gas will be routed to the new incinerator and other equipment as necessary.

In Marsh Lab, existing plumbing systems will be modified and extended to serve all renovated and new areas.

In both buildings, new plumbing fixtures will be low-flow whenever feasible for proper operations. Backflow preventers will be provided to separate potable functions from non-potable functions.

FIRE SUPPRESSION

Fire suppression systems, including automatic sprinklers, will be provided for all new and renovated areas.

ENGINEERED SYSTEMS NARRATIVE

ENGINEERED SYSTEMS NARRATIVE CONT.

ELECTRICAL

The electrical design for this project will include the following:

Marsh Lab

- Upgrade of existing electrical service to the facility including a new main switchboard or distribution panel.
- Permanent and portable standby generator systems will be evaluated to serve critical laboratory loads in the event of a prolonged normal power outage.

New Building

- New electrical service to the new building.
- An emergency and standby generator system to supply emergency power to required life safety, and standby loads in the new facility.

Marsh Lab and New Building

- Electrical distribution systems throughout the building.
- Lighting systems including fixtures and controls.
- Receptacle layouts to support computer equipment, educational technology systems, laboratory equipment and general-purpose needs throughout the facility.
- Outlet boxes and raceway distribution systems to support voice and data needs throughout the facility.
- Necessary electrical service to HVAC equipment.
- Electrical to support access control systems, video surveillance security systems and any other special systems.
- New addressable fire alarm systems.
- Special systems as required by laboratory personnel to support necessary laboratory functions.
- Energy saving technologies will be thoroughly investigated. Those technologies that are cost effective and approved by the Owner will be implemented in the design. These technologies include but may not be limited to occupancy/vacancy sensors, local room controllers and daylighting systems. LED fixtures will be used throughout the majority of spaces. In many spaces dimming will be utilized.

ELECTRICAL DISTRIBUTION SYSTEM

The main electrical distribution system service voltage for both facilities will be 480Y/277 volt, 3-phase, 4-wire. This service voltage is most appropriate for facilities of this size and type, and will reduce electrical losses due to voltage drop in feeders and branch circuits. Dry type transformers and panelboards will be provided as required to support the necessary 208Y/120 volt, 3-phase, 4-wire distribution systems. In general, HVAC equipment and large equipment loads will be served at 480 volts, 3-phase. Lighting throughout the facility will be served at 277 volts, single phase. Laboratory, office, and computer equipment, as well as general-purpose receptacle circuits will be served at 120 volts, single phase. All other equipment and devices will be served by the appropriate distribution system voltage.

Additional electrical distribution system details include the following:

- Surge Suppression Devices (SPDs) will be provided for the main service switchboard and at other locations where load type or code dictate.
- Distribution system switchboards and panelboards will make use of circuit breakers for overcurrent protection of feeders and branch circuits.
- Copper bussing will be provided for all electrical distribution system equipment.
- Digital customer metering equipment will be provided at the main service switchboard, and at other locations as determined by consultation with facilities personnel.
- Separate panelboards will be used to support facility lighting and general-purpose electrical requirements.

Additional electrical service details will be developed as the design process continues. The electrical distribution system as described above will allow for the following:

- System capacity to accommodate present and future loads.
- Maximum flexibility to accommodate future system additions and modifications.
- Efficient service to building lighting, equipment and HVAC loads.

ENGINEERED SYSTEMS NARRATIVE

ENGINEERED SYSTEMS NARRATIVE CONT.

STANDBY/EMERGENCY GENERATOR SYSTEM

The new building will be provided with a diesel driven generator system. The system will be used to supply code required emergency and standby loads. These loads will include but may not be limited to emergency egress and exit lighting, any essential HVAC loads, alarm and communication systems and fire command center equipment. In addition to these Code required loads some capacity will be provided for standby loads as coordinated with the owner. 4-pole automatic transfer switches (with bypass isolation) and emergency distribution panelboards will be provided throughout the facility to serve standby and emergency loads. Load shedding/demand reduction will be investigated and considered when sizing the generator system.

Marsh lab will be evaluated for a permanent diesel or natural gas driven generator system to serve code required emergency and/or standby loads. Provisions for to quick-connect to a portable standby generator system will also be evaluated.

LIGHTING SYSTEMS

Lighting systems will be designed in accordance with IES recommendations and applicable energy codes. Lighting power densities will be minimized by using highly efficient fixtures. Occupancy/vacancy sensors will be used in non-critical spaces to provide automatic off of lighting loads during unoccupied times. In addition, where daylighting opportunities exist, the use of daylighting controlled lighting systems will be investigated. In general, lighting systems will be as follows:

- For traditional wet laboratories it is critical to provide appropriate illumination levels on bench tops, to minimize the impact of shadows created by equipment, casework and personnel, and to minimize the effects of direct and indirect glare on computer and equipment screens. In addition, it is imperative that wet labs be provided with lighting fixtures that can withstand environmental conditions in each space. Recessed, highly efficient, 1'x 4', LED fixtures or pendant mount direct/indirect fixtures will be installed to provide adequate levels of illumination on bench tops, help to minimize issues associated with glare and shadowing, while still providing illumination of vertical surfaces.
- Fixtures in laboratory areas will be equipped with dimming to provide a variety of light levels. In less critical laboratories, normal power fixtures will be enabled by occupancy/vacancy sensors, and controlled locally within each space. A portion of the lighting in all laboratories will be connected to the emergency generator system. Task lighting will be evaluated and if deemed appropriate, provided in each laboratory according to direction provided by the users.

- In chemical storage areas or laboratories that make use of a significant amount of chemicals, the most prudent approach to lighting is 1'x 4' recessed lensed LED troffers. This type of illumination reduces shadowing and provides adequate illumination levels. A portion of the lighting in all areas with high chemical usage will be connected to the emergency generator system.
- In general, private offices will be lighted with recessed, high efficient, 1'x 4', LED fixtures. If ceiling heights allow indirect wall or pendant mounted linear LED fixtures may be utilized. Fixtures will be enabled by occupancy sensors and will be controlled locally to allow for maximum flexibility.
- Conference rooms will be lighted with a combination of linear recessed or pendant mounted LED fixtures, wall wash fixtures and downlights. Fixtures will be equipped with dimming and zoned for various conference functions/scenes. Occupancy/vacancy sensors will be used to enable fixtures, and local switches will be used to provide maximum flexibility.
- Lighting in corridors will be provided by recessed, high efficient, recessed LED fixtures. A portion of these fixtures will be connected to the emergency generator system to provide Code required emergency egress lighting and night lighting.
- Recessed, linear LED fixtures and LED downlight fixtures will be used to provide lighting in bathrooms. A portion of the fixtures located in large bathrooms will be connected to the emergency generator system, and will be used as night-lights. Room occupancy sensors will be used to control all other fixtures.
- Lighting in the telecommunications rooms, mechanical rooms, electrical rooms, custodial rooms and storage areas will be provided by industrial type LED fixtures chain hung from the structure. A portion of the fixtures located in telecommunications rooms, and mechanical and electrical equipment rooms will be connected to the emergency generator system.

RECEPTACLE LAYOUTS

Receptacle layouts and circuiting to support computer equipment, laboratory equipment, telecommunications equipment and general-purpose needs will be provided in accordance with direction provided by building users.

Two channel surface metal raceway systems will be provided above benches in laboratories to support the distribution of power, telecommunications and instrumentation cabling to computer and laboratory equipment. Duplex receptacles will be installed in surface metal raceway systems at intervals dictated by building users. Receptacles in raceway systems will be connected to alternate 20-amp branch circuits.

ENGINEERED SYSTEMS NARRATIVE**ENGINEERED SYSTEMS NARRATIVE CONT.**

In equipment alcoves and shared equipment or instrumentation spaces wall mounted busway will be utilized. The busway will provide quick plug-and-play power re-configuration to accommodate equipment changes. Busway will be rated at 208Y/120V, 3 phase, 4-wire with amperage ratings that vary depending on length. Standard busway receptacle/circuit breaker combination units will be coordinated with equipment requirements and building users.

All electrical devices in laboratories will be labeled with the panel source and circuit number. Dedicated receptacles and circuits will be provided as required to support specific equipment locations throughout the facility. All receptacle branch circuits will be provided with equipment ground conductors. All branch circuit wiring will be copper and will be installed in concealed raceway systems. Ground fault interrupting type receptacles will be provided in all Code required locations, and in all designated "wet" locations throughout the facility.

In animal environments raceways, devices and all installation methods will be in strict accordance with applicable standards. Materials will be anti-corrosive and seal-off fittings and/or other conduit sealant methods will be utilized to maintain pressurization differentials and stop vermin or insect infestation. Many devices in these spaces will also make use of weather proof covers and GFCI protection.

TELECOMMUNICATIONS

Telecommunications equipment rooms and closets will be provided throughout the facility to support the installation of telecommunications equipment and cabling. Outlet boxes, cable trays, and raceway distribution systems will be provided to support the installation and distribution of the telecommunications cabling system.

Cabling, Jacks and all telecommunications equipment required to expand the existing building system will be provided. The entire distribution system will be designed in strict accordance with ANSI/TIA/EIA standards for Category 6 equipment and cabling.

ELECTRICAL SERVICE TO HVAC EQUIPMENT

Electrical service to HVAC equipment will be provided, as required. All necessary starters, disconnect switches, control devices and VFD connections will be provided to ensure a complete and functional system installation. All feeder and branch circuit-wiring to HVAC equipment will be copper, and will be routed in conduit. Conduits will be routed concealed wherever possible.

LIGHTNING PROTECTION SYSTEM

A complete, master labeled, lightning protection system will be provided for the facility if recommended after study or required by the facility owners. The system will be designed and installed in accordance with NFPA, UL and LPI standards and guidelines.

SPECIAL SYSTEMS

Electrical rough-ins, including necessary receptacles and circuits will be provided to support the installation of future Automated Entry Control and Closed Circuit Television security systems. Anticipated security system device locations will be fully and completely coordinated with users. Circuits necessary to support future security system equipment will be served by the emergency generator system. All requirements will be coordinate with the users and the owner's representatives.

FIRE ALARM SYSTEM

An addressable fire alarm control system with provided for both facilities. The systems will be designed in accordance with all current Codes and standards, and will also satisfy all current accessibility guidelines.