

# Lab Lean Improvements

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# Purpose

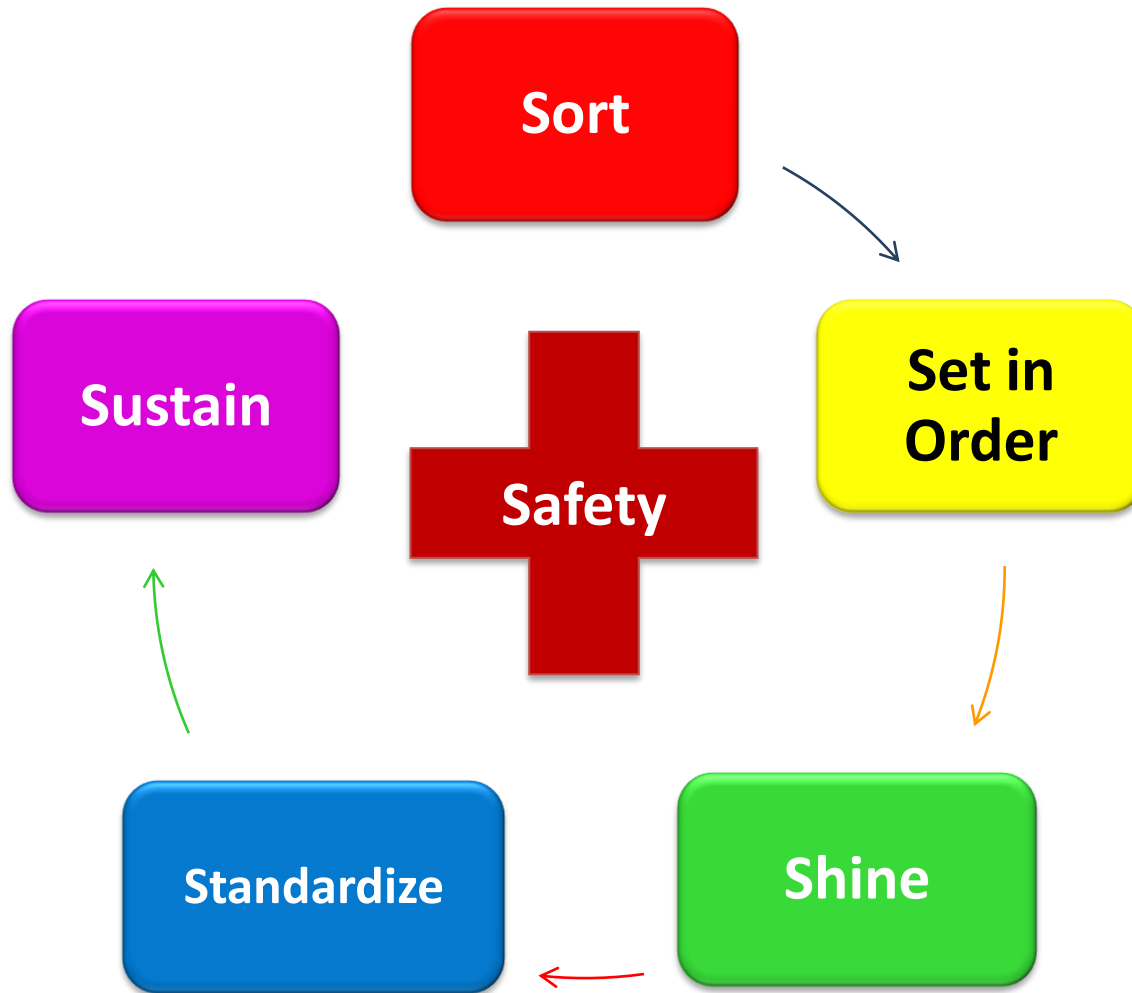
1. Review current lab equipment layout to ensure proper location
2. Increase floor space
3. Add additional bench space
4. Create more usable bench space

# Improvement Method

**Rapid Improvement Events:** These events help drive change and improvements at Children's Hospital. Front-line staff are selected to provide input and implement the changes in real time.

**Lean Tool:** 5S is a systematic approach to an organized workplace. 5S efforts help improve safety, organization, quality, and employee morale.

# 5S+Safety Steps



# 5S + Safety



**SORT:** Separating the needed from the not-needed



**SET IN ORDER:** A place for everything and everything in its place, clean, and ready to use



**SHINE:** Cleaning for inspection



**STANDARDIZE:** Developing common methods for consistency



**SAFETY:** Ensure a safe working environment through inspection, evaluation, and follow-up



**SUSTAIN:** Holding the gains and improving

# Benefit of 5S+Safety



**Cleaner work areas**



**More organization**



**Safer working conditions**



**More effective work processes**



**Less wasted time completing work**



**Less space needed**

# Rapid Improvement Event Dates

- **Monday, 9/8/14:** Micro Biology
- **Tuesday, 9/9/14:** Blood Bank, Coagulation, Urinalysis
- **Wednesday, 9/10/14:** Chemistry
- **Thursday, 9/11/14:** Hematology & Phlebotomy
- **Friday, 9/12/14:** Send Out/ Front Office

# Team Members

- **Blood Bank, Coagulation, Urinalysis:** Susan
- **Chemistry:** Cathy
- **Front Office:** Belinda
- **Hematology:** Delilah
- **Micro Biology:** Charlene
- **Phlebotomy:** David
- **Send Out:**

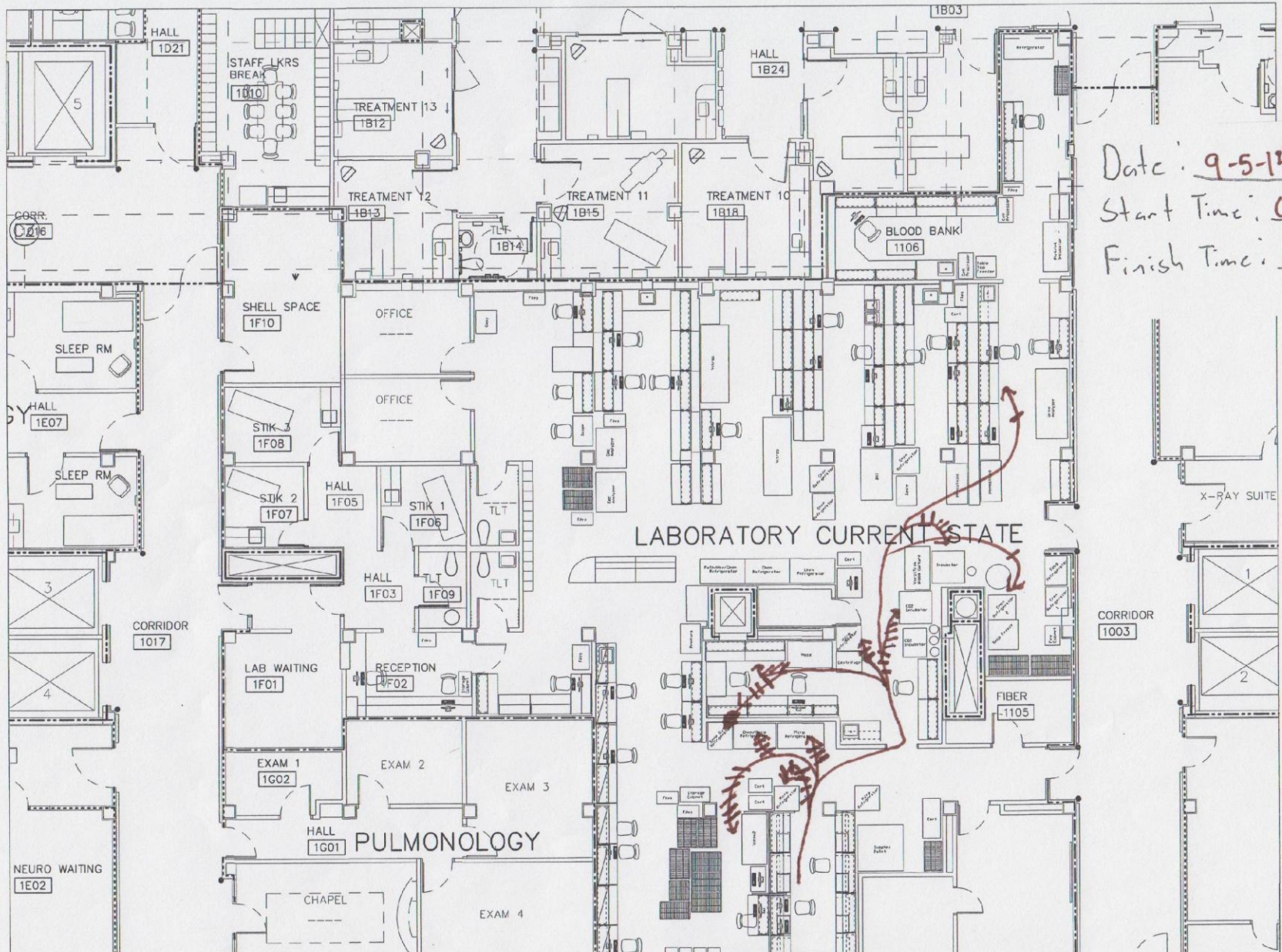




# Relocate Equipment

- Spaghetti diagrams are a visual representation of an employee or product movement through an area.
- Spaghetti diagrams are conducted to better understand where employees work and what they need to do their job.
- 21 spaghetti diagrams were completed to determine walking distance and frequency.

# Sample Spaghetti Diagram



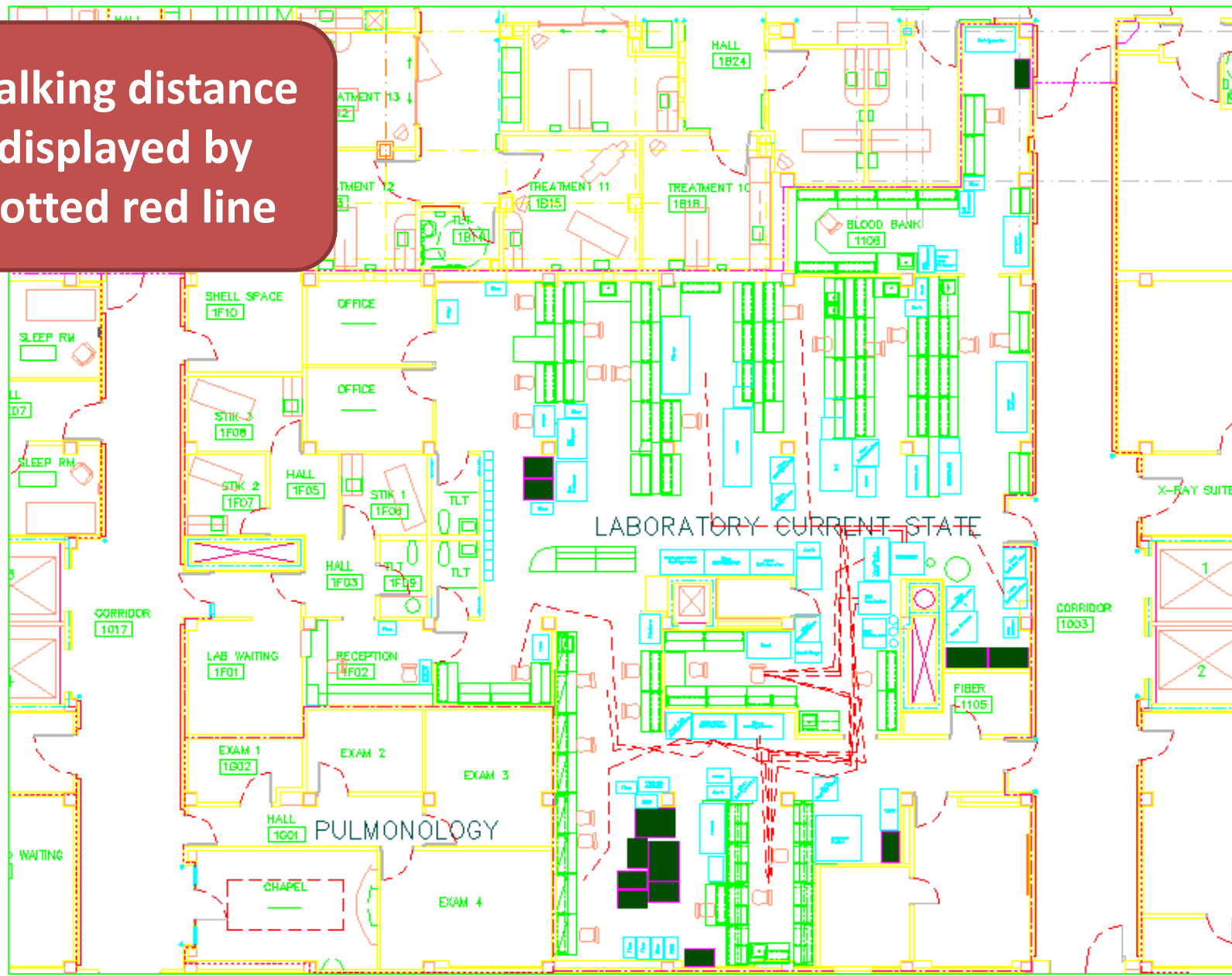
Date: 9-5-14  
Start Time: 0530  
Finish Time: 1935

X-RAY SUITE

CORRIDOR 1003

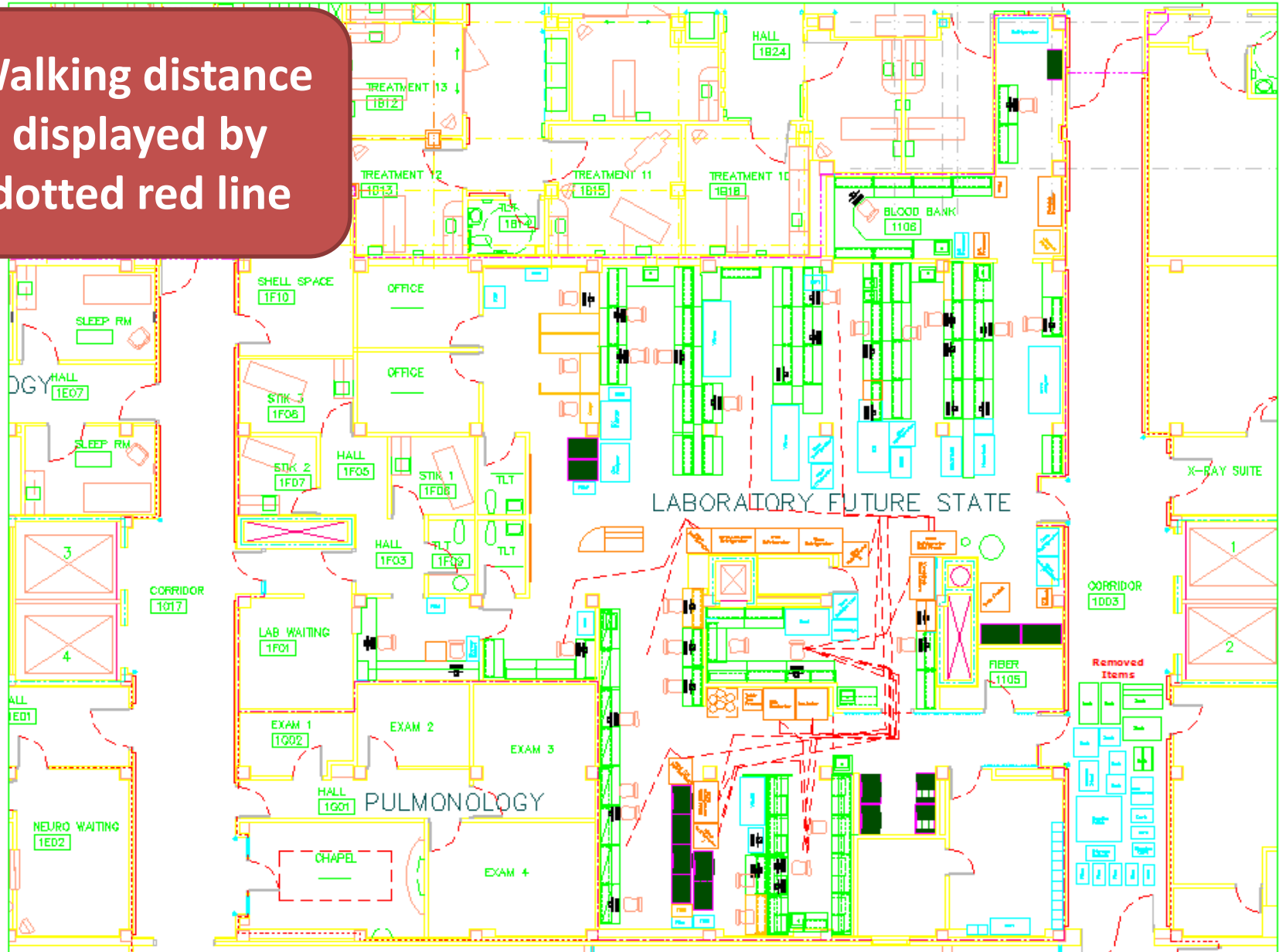
# Before Measurements in AutoCAD

Walking distance  
displayed by  
dotted red line



# After Measurements in AutoCAD

Walking distance  
displayed by  
dotted red line



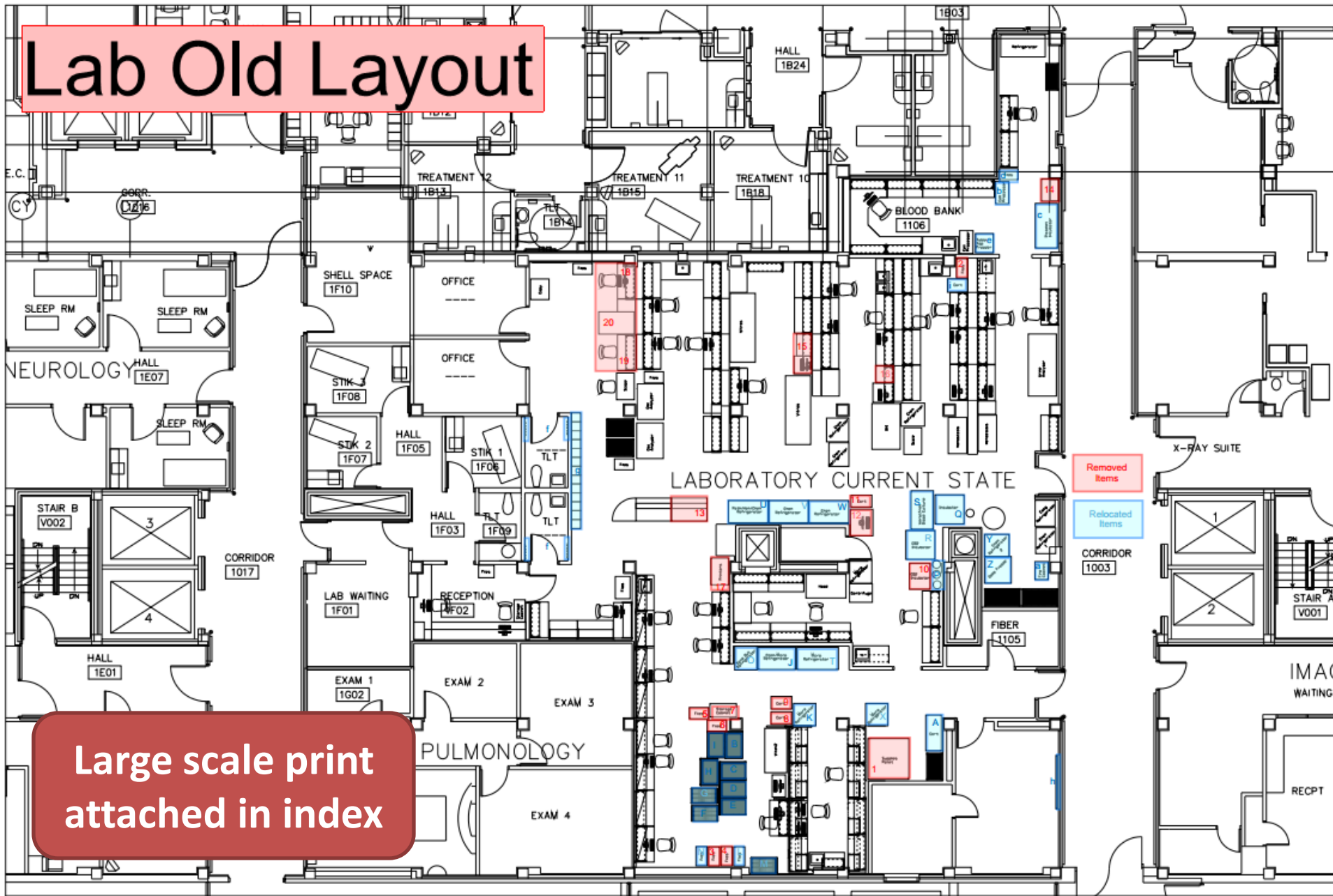
# Walking Distance Comparison

Item Letter	Item Description	Walking Distance (in)		Distance Difference (in)	Average Freq. per Shift	Walking Distance Saved per Shift (ft)	Walking Distance Saved a Year (ft)
		Before	After				
R	CO2 Incubator						
	From Micro Plating	202	342	140	2	23.33	25550
	From Micro Reading	429	171	(258)	6	(129.00)	(141255)
Q	Incubator						
	From Micro Plating	372	308	(64)	3	(16.00)	(17520)
	From Micro Reading	606	162	(444)	5	(185.00)	(202575)
S	VersaTrek Blood Culture						
	From Micro Plating	236	180	(56)	3	(14.00)	(15330)
T	Micro Fridge (Double Wide-Solid)						
	From Micro Plating	333	328	(5)	2	(0.83)	(913)
	From Micro Reading	170	581	411	2	68.50	75008
J	Micro Fridge (Double Wide- Glass)						
	From Micro Plating	358	489	131	1	10.92	11954
	From Micro Reading	208	241	33	2	5.50	6023
K	Micro Fridge (Single Wide)						
	From Micro Plating	240	474	234	1	19.50	21353
	From Micro Reading	201	282	81	7	47.25	51739
O	Send-out Fridge						
	From Send-out	240	159	(81)	12	(81.00)	(88695)
	From Chemistry	781	816	35	4	11.67	12775
X	Blood Serum Fridge						
	From Send-out	446	275	(171)	5	(71.25)	(78019)
	From Chemistry	740	430	(310)	3	(77.50)	(84863)
	From Phlebotomy	192	189	(3)	4	(1.00)	(1095)
Y	Chemistry Fridge						
	From Chemistry	583	375	(208)	1	(17.33)	(6327)
<b>Sum Walking Distance (ft)</b>						<b>(406)</b>	<b>(432190)</b>
<b>Sum Walking Distance (mi)</b>						<b>(0.08)</b>	<b>(81.85)</b>

**21%  
Reduction!**

# Relocated Needed Items and Remove Unneeded Items

## Lab Old Layout



Large scale print  
attached in index

# Remove Unneeded Items and Equipment

- Survey sent on 9/2/14 to all Lab staff members for feedback on items that are no longer needed.
  - **Question:** What items are no longer needed in your section?
  - **Responses:** Old parts, old computers, old CO2 incubator, old paperwork, label printers, excessive stock, supplies in drawers.



# Lab Survey Results

#	Question	Scale 5 = Strongly Agree to 1 = Strongly Disagree			
		Pre Intervention Data (n=23)	Post Intervention Data (n=21)	Change (Positive Number is Good)	% Change
1	I have the overall space I need to do my job.	2.70	4.00	+ 1.3	48%
2	I have the bench space I need to do my job.	2.65	3.86	+ 1.21	46%
3	I am able to quickly locate needed items within my section.	2.87	3.76	+ 0.89	31%
4	I am able to quickly locate needed items within the lab.	2.74	3.76	+ 1.02	37%
5	Supply items and equipment are located in the proper location within my section.	3.13	3.90	+ 0.77	25%
6	Supply items and equipment are located in the proper location within the lab.	2.78	3.86	+ 1.08	39%
7	My section of the lab is consistently clean.	2.96	3.95	+ 0.99	33%
8	My section of the lab is consistently organized.	2.61	3.90	+ 1.29	49%
9	I work in a safe environment.	3.48	4.24	+ 0.76	22%

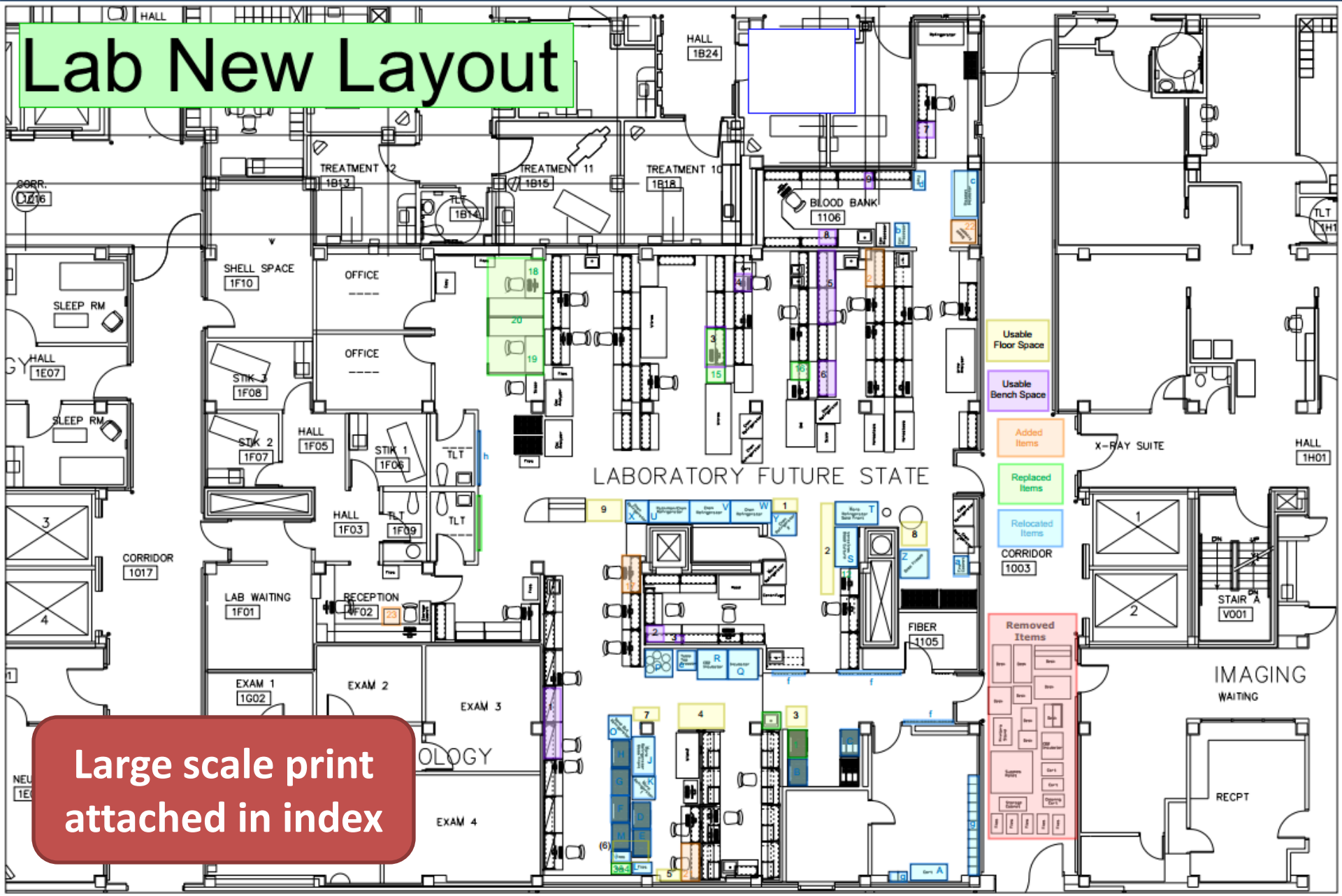
**36%  
Improvement**

#	Question	Scale 5 = Very Satisfied to 1 = Very Dissatisfied			
		Pre Intervention Data (n=23)	Post Intervention Data (n=21)	Change (Positive Number is Good)	% Change
1	Overall, how satisfied are you with the work environment in your section?	3.04	4.00	+ 0.96	32%
2	Overall, how satisfied are you with the work environment in the entire lab?	2.91	4.05	+ 1.14	39%



# Add Bench Space and Floor Space

## Lab New Layout



Large scale print attached in index

# Sample Before and After Pictures



**Before:** CO2 tanks were located behind the incubators making them hard to replace.

**After:** CO2 tanks are now located on a main hallway with easy access.



# Sample Before and After Pictures



**Before:** Unneeded items and boxes were taking up needed bench space.

**After:** Items were removed to create more bench space.



# Sample Before and After Pictures



**Before:** Equipment location and unneeded items took up floor space.

**After:** Removed unneeded items are relocated to create additional floor space.



# Sample Before and After Pictures



**Before:** Excess file and extra file cabinets took up much needed floor space.

**After:** Consolidated files and placed them in taller file cabinets that take up less floor space.



# Sample Before and After Pictures



**Before:** Excess items and table tops were creating tight working space and walk through space.

**After:** Removed unneeded items to create more usable space.



# Clear Egress in the Lab



# Square Footage Changes

Removed Items				
Number	Description	Length (in)	Width (in)	Square Footage
1	Blood Culture Pallet	12	24	2.00
2	Four Drawer File Cabinet	30	26	5.42
3	Two Drawer File Cabinet	30	26	5.42
4	Two Drawer File Cabinet	30	26	5.42
5	Two Drawer File Cabinet	30	26	5.42
6	Two Drawer File Cabinet	30	26	5.42
7	Metal Storage Cabinet	36	18	4.50
8	Supply Cart	28	18	3.50
9	Supply Cart	28	18	3.50
10	Back up CO2 Incubator	36	28	7.00
11	Supply Cart	28	18	3.50
12	Desk	30	36	7.50
13	Send Out Desk	31	48	10.33
14	Work Surface	24	30	5.00
15	Desk	24	54	9.00
16	Stand	24	36	6.00
17	Printer Stand	24	36	6.00
18	Supervisor Desk	24	50	8.33
19	Desk	24	50	8.33
20	Storage Surface	30	48	10.00
21				
22				
23				
<b>TOTAL</b>				<b>121.58</b>

Replaced Items				
Number	Description	Length (in)	Width (in)	Square Footage
1	Supply Rack			
2				
3	Five Drawer File Cabinet	30	26	5.42
4				
5				
6				
7				
8				
9				
10				
11				
12	Desk	24	36	6.00
13				
14				
15	Desk	24	60	10.00
16	Desk	24	24	4.00
17				
18	Supervisor Desk	24	48	8.00
19	Desk	24	48	8.00
20	Desk	48	60	20.00
21				
22				
23				
<b>TOTAL</b>				<b>61.42</b>

Additional Work Surfaces and Added Items					
Number	Description	Length (in)	Width (in)	Square Footage	Linear Footage
1					
2	Work Surface	48	24	8.00	4.00
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17	Work Surface	40	24	6.67	3.33
18					
19					
20					
21	Work Surface	48	24	8.00	4.00
22	Freezer	32	30	6.67	2.67
23	Front Office Desk	24	24	4.00	2.00
<b>TOTAL</b>				<b>29.33</b>	<b>14.00</b>

NET Between Removed and Replaced 60.17

Usable Floor Space Added				
Number	Description	Length (in)	Width (in)	Square Footage
1	Micro 1	36	16	4.00
2	Micro 2	120	18	15.00
3	Micro 3	30	30	6.25
4	Micro 4	36	60	15.00
5	Micro 5	30	18	3.75
6	Phlebotomy 6	40	36	-10.00
7	Phlebotomy 7	36	18	4.50
8	Chemistry 8	30	30	6.25
9	Send Out 9	31	48	10.33
10				
<b>TOTAL</b>				<b>55.08</b>

**109 Square Feet of Additional Bench Space!**

Usable Bench Space Added					
Number	Description	Length (in)	Width (in)	Square Footage	Linear Footage
1	Phlebotomy 1	96	24	16.00	8.00
2	Micro 2	24	24	4.00	2.00
3	Micro 3	10	12	0.83	0.83
4	Chemistry 3	48	24	8.00	4.00
5	Chemistry 4	24	24	4.00	2.00
6	Chemistry 5	96	24	16.00	8.00
7	Chemistry 6	48	24	8.00	4.00
8	Blood Bank 7	24	24	4.00	2.00
9	Blood Bank 8	24	24	4.00	2.00
10	Blood Bank 9	12	24	2.00	1.00
<b>TOTAL</b>				<b>66.83</b>	<b>33.83</b>



# Summary of Result

- **Removed unneeded equipment to create more space: 60 ft<sup>2</sup>**
- **Additional work surfaces/bench space: 29 ft<sup>2</sup> or 14 linear feet**
- **Usable floor space added by relocating items: 55 ft<sup>2</sup>**
- **Usable bench space added by removing unneeded items: 67 ft<sup>2</sup> or 33 linear feet**
- **Reduction in walking distance by relocating items: 406 ft<sup>2</sup> a shift or 81 miles a year**