



# Master Plan Report

Mountain Line

Kaspar Headquarters Master Plan

*Flagstaff, AZ 86004*

October 28, 2022

**FINAL**



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# 1 Executive Summary

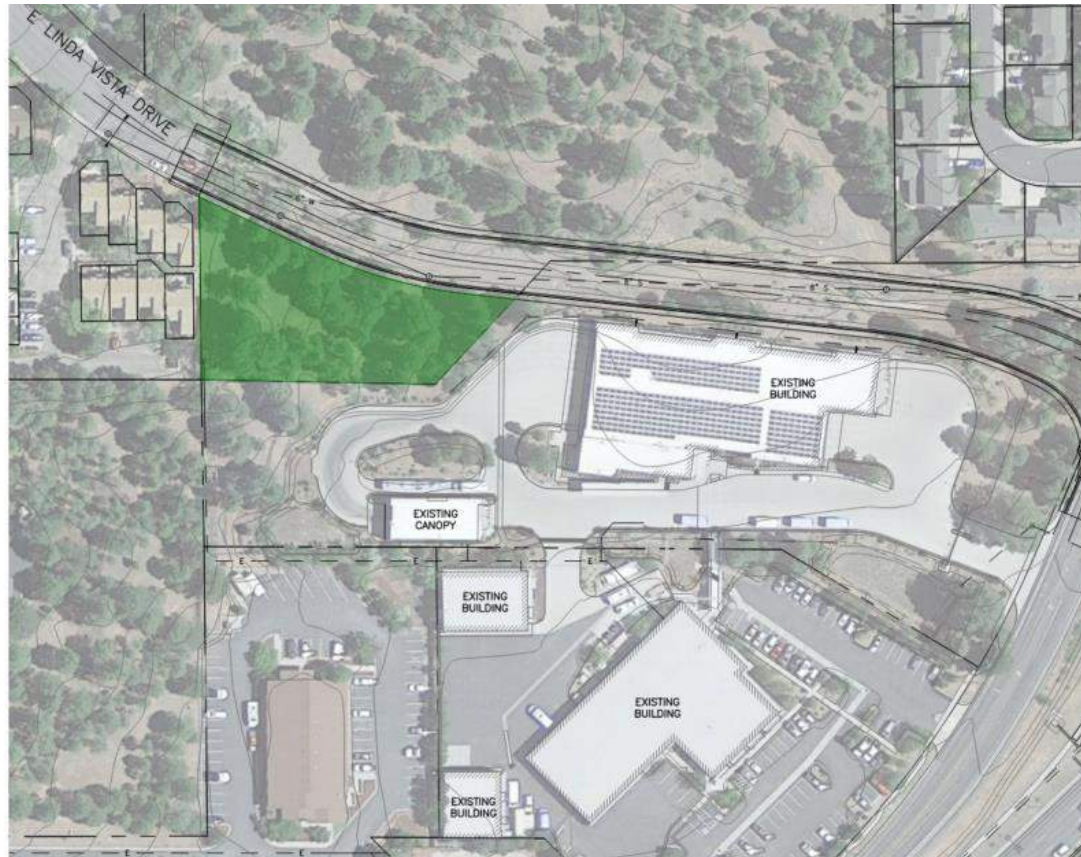
## 1.1 Key Recommendations

This report presents a Master Plan for the Mountain Line Kaspar Headquarters Facility (KHQ) projected 20-year horizon needs, planned growth, and facility recommendations.

**Key Recommendations include:**

1. **Adopt Concept A as the Master Plan.** This preferred alternative Concept A was identified with staff and Mountain Line Board input which compared alternative Concepts A, B, and C. Reference concepts in Section 6. Concept A addresses the immediate needs for a new Maintenance Facility, allows for phased integration of electrification, and plans for phased growth to accommodate anticipated fleet/service through 2043. The Concept A phasing allows the Administration and IT/Data staff to stay at the Kaspar site until the Downtown Connection Center (DCC) phase 1 construction is complete. Operations will remain in the existing office facilities at the Kaspar site until the need for additional bus storage triggers the need to demolish the existing administrative facility and replace it with a larger 2 story bus storage, operation offices and staff parking.
2. **Dispose of the Linda Vista Vacant Land Parcel:** The Kaspar Master Plan conducted a feasibility study of the vacant land for transit use which identified both technical, relational, and budgetary challenges to develop the property for bus storage. Disposition of the property will provide revenue to Mountain Line to match future FTA grants to implement Concept A.
3. Obtain City and County administrative approval of a Lot Line Adjustment between the vacant land and developed parcel. It is recommended the lot line adjustment generally follow the future southerly right of way of Linda Vista Extension. This will allow for a trapezoidal area south of the future extension of Linda Vista Road to remain with Mountain Line ownership. This trapezoidal area will be essential to replace the required preservation of natural resources (native trees) on the main campus site that will be lost in the full build-out of the Master Plan.

**Figure 1-1. Trapezoidal Area Diagram**



4. Update the existing Conditional Use Permit (CUP) for the Kaspar Headquarters site to obtain the necessary approvals for the phased components of the Master Plan in advance of submitting the first projects for building department review and approval. Rezoning will be required for the trapezoidal area from Multi-Family Residential to Highway Commercial. Rezoning can be pursued with Mountain Line's future CUP at the time of a future development application to the City.
5. Move forward with the construction of the Electrification Project to support the initial ZEBs arriving by 2022, as developed by the HDR team in accordance with the Master Plan.
6. Move forward with the detailed programming, planning and design of the new Maintenance Building as soon as funding allows. Mountain Line may use the recommendations in the Kaspar Master Plan to support future grant funding applications for final design and construction. Outline grant strategy and timeline for future grant applications to secure funding to construct Phase 1 within three years (2025) and Phase 2 bus storage by 2027.

The Master Plan, Program and Studies included in this report were developed in close collaboration between Mountain Line leadership and the HDR team. The stakeholder groups involved in this master plan include Administration, Operations, Information Technology (IT), Fleet Maintenance, and Facilities Maintenance. The report encompasses input from the stakeholders, together with HDR's recommendations based on thorough review, analysis and assessment of current state and future needs.

The information shared in this report will provide large scale improvements for the facility. The KHQ Master Plan was generated by evaluating the existing property utilized, facility functional operations, staffing projections, fleet electrification transition plan, project phasing, and facility resiliency. The Master Plan Report provides concept designs and project budgets for the recommended concept provided in the report. Mountain Line will be able to utilize this report as a vision and plan to identify and budget for the future of the KHQ.

In its current state, daily operations at KHQ consist of five buildings that supports Mountain Line's bus operations and maintenance on a 6.81 acre site. In addition, Mountain Line owns a vacant property to the north of the facility that is sloped, wooded, and zoned for high density residential development. The existing facility is undersized and additional bus storage space is needed to accommodate the future growth in the bus fleet. The goal, given by Mountain Line, is to fit as many buses as possible at this site and develop the facility to a maximum capacity.

## 1.2 Master Plan Goals

1. Improve efficiency and safety of Operations and address needed facilities growth
  - Evaluate existing facilities for deficiencies and recommended expansion to accommodate fleet/service through 2043
  - Provide the maximum facility capacity for bus operations and maintenance
  - Identify likely timing of key program components and phasing
  - Facility Life Cycle Cost Analysis
2. Plan for optimal Use of the Kaspar Site to meet Mountain Line's projected growth through 2043
  - Plan for Phased evolution from hybrid diesel fleet to an all-electric fleet by 2043
  - Plan for Phased Development of the site while maintaining continuous Operations
  - Evaluate impact of Administration move to the DCC including the residual federal investment value of the existing administration building.
  - Evaluate the Value of the Vacant Land Site and make recommendations as to its disposition
    - Consider impact of City of Flagstaff requirements for extension of Linda Vista Road
    - Consider impact of City of Flagstaff requirements and timeline for Zone Change/public hearings required for industrial use of Vacant Land Site
    - Recommendation to keep area south of road for landscape/tree preservation and what that will require for City Approvals
  - Evaluate Resiliency of Kaspar site, infrastructure, and facilities

The Executive Summary section gives an overview of the results and recommendations from the facility evaluation and planning that HDR and Mountain Line stakeholders underwent from November 2021 through July 2022. The executive summary is broken up into the following sections of the report:

- Programming
- O&M Life Cycle Costing

- Phasing Plan
- Vacant Land Feasibility Study
- Concept Plans
- Cost Estimates
- Resilience Plans

## Programming

### *Staffing and Fleet Overview*

Staff growth at KHQ over the next 20 years is expected to increase approximately 27% to accommodate the planned growth in service and fleet expansion.

**Table 1-1. Kaspar Facility Staff**

Position	Existing Conditions	2028	2033	Master Plan 2043	Shift	Status
<b>Kaspar Headquarters</b>						
Administration	18.75	0	0	0	Day	Varies
Operations	67	77	92	118	Varies	Varies
Maintenance	12.5	14	19	23	Varies	Varies
Information Technology	4	0	0	0	Day	Varies
<b>Total</b>	<b>102.25</b>	<b>91</b>	<b>11</b>	<b>141</b>		

Source: Space Needs Program – Table 3. Staffing Summary

The expansion of the fleet of buses is limited at KHQ because of the site constraints. However, the facility master plan indicates that the facility will be able to accommodate the planned bus fleet growth through 2043 of 64 buses of varying sizes and stored indoors out of the weather.

**Table 1-2. Kaspar Facility Bus Fleet**

Vehicle Type	Existing Conditions	2028	2033	Master Plan 2043	Parking Size (feet)
Paratransit Unleaded Fuel	7	6	6	0	14 x 35
Paratransit Electric	0	1	3	12	14 x 35
Standard Hybrid	23	12	6	0	14 x 45
Standard Electric	0	14	26	42	14 x 45
Articulated Hybrid	6	4	3	0	14 x 70
Articulated Electric	0	2	6	10	14 x 70
<b>Total</b>	<b>36</b>	<b>39</b>	<b>50</b>	<b>64</b>	

Source: Space Needs Program – Enclosed Vehicle Parking Table

The facility capacity is a balance of the number of buses and the number of repair bays to maintain those buses. The master planned facility will be at maximum capacity with the number of buses and the size of the maintenance facility. The maintenance facility will have five repair bays and one chassis wash bay to maintain the 68 buses. This is a repair ratio of 13.6 buses per bay and is within the industry standard of 12-15 buses per bay.

### *Building & Site Area*

As Mountain Line expands their operations, funding and resources for new infrastructure is needed to construct the bus operations and maintenance facility in phases. The facility master plan indicates that the new facility buildings will be double the size of the current facility to approximately 103,000 square feet.

The physical site area at the ground level did not increase. However, the facility master plan addresses additional parking required at KHQ by providing rooftop employee parking above the maintenance and bus storage areas. This area will be accessed by a ramp that will require a new curb cut/driveway off Kaspar Drive to enhance the separation of bus fleet movement from private vehicle movement.

Reference Figure 2.4 Space Needs Program Summary in Section Two showing estimated projected growth in both building and site areas.

### *O&M Life Cycle Costing*

HDR evaluated the current and projected future O&M costs. It is anticipated that the O&M costs will be approximately double the current cost of \$161,000 to \$316,000 in current year dollars. See the table below for the Summary of the estimated O&M future costs.

**Table 1-3 Future Life Cycle Costs**

O&M Function	Annual Labor Future Cost	Other Annual Future Costs
<b>Operations Building</b>		
1.0 Building Maintenance	\$3,335	\$62,500
2.0 Utilities	--	\$63,538
<b>Bus Storage Building</b>		
1.0 Building Maintenance	\$3,335	\$19,500
2.0 Utilities (includes EV charging)	--	\$59,292
<b>Service Facility</b>		
1.0 Building Maintenance	\$2,223	\$3,500
2.0 Utilities	--	\$4,630
<b>Maintenance Building</b>		
1.0 Building Maintenance	\$3,335	\$13,500
2.0 Utilities	--	\$28,167
3.0 Parking Deck Maintenance	--	\$8,800



O&M Function	Annual Labor Future Cost	Other Annual Future Costs
<b>Facilities Maintenance Building</b>		
1.0 Building Maintenance	\$3,335	\$5,000
2.0 Utilities	--	\$6,852
3.0 Site Maintenance	\$1,112	\$23,900
<b>Totals</b>		
<b>Totals</b>	<b>\$16,674</b>	<b>\$299,180</b>
<b>Annual O&amp;M Costs</b>	<b>--</b>	<b>\$315,854</b>

## Phasing Plan

The new maintenance facility is needed immediately to replace the current and undersized in limited function and indoor heated bus storage is also at capacity in Shop 2 and Shop 3. It is recommended to begin design in 2023 for the design of the whole project and start construction for the Phase 1 maintenance facility in spring of 2024.

According to the timeline for the bus fleet growth, (see timeline below), additional heated bus storage will be required beyond the Phase 1 capacity by 2024 and it is recommended that construction for Phase 2 begin in the Spring of 2026.

**Figure 1-2. Phasing Plan**

Phase	Phasing Plan																							
	Curr.	PH 1 Design/Const.				PH 2 Const.				Occupy Phase 2														
Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043		
Standard Buses Hybrid	23	21	19	16	13	10	7	4	12	6	6	6	6	6	4	4	4	4	2	2	2	0		
Articulated Buses Hybrid	6	6	6	6	6	6	6	6	5	4	3	3	3	3	2	2	1	1	1	1	0			
Standard Buses - EV	0	2	4	8	11	16	19	22	16	20	24	26	26	29	29	32	32	35	35	38	38	42		
Articulated Buses - EV	0	0	0	0	0	0	0	0	1	4	4	6	6	6	6	7	7	8	8	9	9	10		
Subtotal Fixed Route	29	29	29	30	30	32	32	32	34	34	37	41	41	44	42	45	45	48	46	50	50	52		
Paratransit Buses (Gas)	7	7	6	6	5	5	5	4	4	4	4	3	3	3	2	2	2	1	1	0	0			
Paratransit Buses - EV	0	0	1	1	2	2	2	3	4	4	4	5	5	6	7	8	9	10	10	12	12	12		
Subtotal Paratransit	7	7	7	7	7	7	7	7	8	8	8	8	8	9	9	10	11	11	11	12	12	12		
<b>Total Bus Fleet</b>	<b>36</b>	<b>36</b>	<b>36</b>	<b>37</b>	<b>37</b>	<b>39</b>	<b>39</b>	<b>39</b>	<b>42</b>	<b>42</b>	<b>45</b>	<b>49</b>	<b>49</b>	<b>53</b>	<b>51</b>	<b>55</b>	<b>56</b>	<b>59</b>	<b>57</b>	<b>62</b>	<b>62</b>	<b>64</b>		

See Section Four Phasing Plan for images of the phased KHQ Master Plan.

## Vacant Land Feasibility Study

Mountain Line staff and the HDR team met with representatives from the City of Flagstaff to better understand whether the property to the north of the existing campus could be effectively used for expanded operations and maintenance facilities. Reference Table 5.1 in Section Five for the commentary from the questions that Mountain Line had for the City and their responses.

Utilizing the site north of the future extension of Linda Vista Drive for transit posed several major technical, budgetary and relationship challenges. The first technical challenge related to the slope of the existing site much of would fall into the City's Habitat Protection requirements rendering significant parts of the site unbuildable. The second technical challenge was how to get buses and/or operators across the road safely. Options including at grade crossings and/or a pedestrian bridge while relatively cost effective in terms of initial construction costs would impact the long-term operational efficiency of utilizing the northern site for transit and would ultimately cost far more over

the life of the project. Next alternatives were briefly considered utilizing the change in grade to provide a tunnel under the road but the need to go under existing utilities in the right of way further complicated that option. Tunneling under the road would also have required a multi-structure facility with employee parking above an indoor below-grade built into the slope of the site. These budgetary impacts would have been further exacerbated by the year to two-year timeline for processing a zone change from multifamily housing use to industrial use that the City staff felt would be uncertain to win approval from either the neighbors or the Planning Commission or City Council. In addition to the budgetary impacts, seeking this modification had the potential of negatively impacting positive working relationship between Mountain Line, your neighbors and the City as a whole.

Given this input, staff instructed HDR to focus on finding a master plan solution that did not rely on the northern site. The recommended Concept A proposes vertical development that optimizes the use of the existing Kaspar site still respecting the height limitations of the highway commercial zoning. As noted in the Recommendation Section this will require both the Lot Line Adjustment and an updated CUP to move forward with the Concept A Master Plan.



## Concept Plans

### Phase One Level One



### Phase One Level Three



### Phase Two Level One



### Phase Two Level Three





## Cost Estimates

The project is constructed in phases; therefore, an estimate has been prepared to provide total construction costs with escalation for each of the phases. The estimate excludes hard rock excavation, FF&E, and soft costs.

Start Phase 1 Design 2023 and Construction in 2024- \$17,999,000

Start Phase 2 Construction in 2026 (escalation included) - \$32,226,000

## Resilience Plans

In the immediate term HDR recommends that infrastructure standby power is need for Dispatch and IT communications supporting dispatch.

Recommend future standby power needs include, pantograph bus chargers, all IT communications, diesel fueling system, site security including door hardware and cameras, critical heating and cooling systems and shop 1 and 2 for bus maintenance.

For the new facility HDR recommends electrical service consolidation and new service should include space for future connections to Shop 3, photovoltaic arrays, admin, and a standby generator.

## 2 Programming

### 2.1 Project Overview

#### 2.1.1 Introduction

Mountain Line is the public transit agency serving the Flagstaff area with a fleet storage, maintenance and administration facility located on Kaspar Drive, Flagstaff, Arizona. Mountain Line provides Flagstaff and the surrounding communities with 9 different lines.

The Kaspar Headquarters Master Plan (KHMP) will maximize fleet storage capacity and maintenance uses for a long-term horizon to accommodate Mountain Line's growth as a regional transportation provider. The existing Kaspar Headquarters facilities are currently at capacity for fleet storage, maintenance, and administration services to support current transit service levels. There is no capacity for additional fleet storage and maintenance, as configured today, to support future growth for transit service. The KHMP will analyze the existing Kaspar facilities and Mountain Line's adjacent property to identify opportunities and barriers to growth, safety, and state of good repair.

Mountain Line has realized their current facility is greatly undersized to accommodate their current fleet, let alone future needs. HDR was hired by Mountain Line and tasked with documenting the existing site, facilities, and functions performed by the following departments:

The various user groups that will be included are:

- Administration
- Operations
- Fleet Maintenance
- Facilities Maintenance
- Information Technology

#### 2.1.2 Methodology

The most successful facility projects begin with gaining an understanding of the functions or operations to be performed within each facility. HDR, with valuable insight and direction that otherwise may not have been collected using less interactive programming methods, drew upon its involvement in numerous other bus operations and maintenance facilities efforts and utilized this background to benefit and streamline the programming and planning processes.

Mountain Line put a constraint on the future design to limit any alterations (if any) on their current Shop 3 and Bus Wash buildings. There is also temporal (phasing) restraints on impacting existing employee parking areas and impacting the administrative building due to federal investments. HDR has been working with the Mountain Line team addressing growth, change, future working conditions and how they are predicted to look different than they do now when considering office space needs and flex shared spaces.

Mountain Line provided HDR a 20-year growth expectation for their staff, fleet, maintenance, and office needs. HDR developed a program that considers the next 10 years (2032) and 20 years (2042) into the future based on the following 20-year forecasting assumptions.

- Double Service Hours to 150,000 annually (currently at 75,000)
- Estimated 52 fixed route bus fleet (42 buses in service/10 spares)
- Facilities: Full buildout DCC, Kaspar HQ and Campus Bus
- Increase bus stop network by 50% to 250 bus stops (currently at 165 stops)

### 2.1.3 Existing Site and Facilities

Mountain Line Headquarters is comprised of three parcels: APN 113-22-001M (3773 N. Kaspar), APN 113-22-001T (3825 N. Kaspar) and undeveloped parcel APN 113-22-001S, (3520 E. Linda Vista) The developed site consists of approximately 6.81 acres and currently is comprised of six existing facilities and the two developed parcels.

- Shop 0 and the administration building was remodeled from a previous car dealership in 2006, to accommodate administration, fleet, and facility's offices.
- The administrative portion of the building is approximately 10,930 SF accommodating administrative and operations support related offices, conference rooms, lockers, mailroom, common areas for employee breakroom, restrooms, wellness room,
- Shop 0 is approximately 8,500 sf dedicated to paratransit fleet storage, tire storage, parts storage, facilities, and fleet maintenance offices.
- Shop 1 is used for two fleet maintenance bays for servicing fixed route and paratransit buses. In addition, Shop 1 also is used for storing tools. Shop 1 is 2710 sf.
- Shop 2 is 3,970 sf and includes facilities maintenance storage and bus storage.
- Shop 3, constructed in 2014, includes bus storage, restroom facilities, and training area. Shop 3 is 24,445 sf.
- A single-lane, enclosed bus wash building that is 2,700 sf.

#### Facility Opportunities

- The developed site adjoins Mountain Line's vacant land parcel which may offer opportunity for bus storage and/or maintenance functions. This opportunity will be studied for feasibility as part of the master plan project. The vacant land is currently zoned high density residential and would require a city conditional use permit (CUP) if Mountain Line develops the property for a transit use.
- The current Shop 3 Facility is working well for storing buses and accommodating meetings amongst the transit operators and providing extra locker and uniform storage space.
- The Bus Wash building well serves the current and future needs for the maintenance team to successfully keep Mountain Line's fleet clean.

- Most of the administration team, except for IT, that work in the administrative building, will be moving to the new DCC location allowing the administrative portion of the building to be reprogrammed and renovated as needed to help with the future growth of operations and maintenance at the Kaspar Headquarters location.

### Facility Challenges

- Due to the position and angled orientation of the existing facilities, the existing site is congested, resulting in restricted vehicle circulation for the different-sized buses to access the different facilities for maintenance, storage, wash, or fuel.
- There is no additional bus storage capacity available at the Kaspar Facility within the current boundary. Mountain Line's planned growth to operate about 23 more buses with plan to transition to battery electric fleet (BEB) by 2032 will require charging infrastructure and increased footprint requirements which may trigger need for development of the vacant land or locating buses on another site.
- There is only one driveway entrance for fleet, causing the vehicular circulation to get congested especially during peak times. This causes buses to wait at the gate before exiting and when returning.
- The current building configuration of Shop 1, Shop 2, the bus wash, and Shop 3 requires some buses to have to make a reverse movement to get correctly aligned with the doors in the building. An example is the exit to the bus wash, where the curve is too tight to allow a bus to turn without having to make a reverse movement.
- Mountain Line currently only has two standard size bus repair bays that do not fit articulated buses. As they add more to their fleet, they will need to add additional repair bays to accommodate both standard (35') and articulated (65') buses.

**Figure 2-1. Existing Facility Site**



## 2.1.4 Site Description

Based on the site circulation requirements as defined in this program, the goal will be to study design strategies for improving vehicular access through possible modifications to the existing facilities as well as exploring the potential development of the adjacent northern vacant land. However, there is a possibility the site will need to expand beyond this location in the future to accommodate Mountain Line's predicted growth. As the staff from majority of the Administration relocate to the Downtown Connection Center, that leaves space for reconsideration and configuration within "Shop 0" and the administrative building.

## 2.1.5 The Planning/Design Team

The purpose of this document is to define operational and maintenance functions, future staffing needs, functional requirements, and space needs by way of programming planning, which will serve as a basis for design of the re-configured facilities. HDR will first consider the existing areas and buildings on the site and then evaluate the different program of each building and design the best master plan the current site and vacant

parcel of land can offer to Mountain Line now and to accommodate their growth 20 years in the future.

HDR met with Mountain Line in a series of programming interviews with key staff to stimulate dialogue about staffing, vehicle projections, office, shop, and storage space requirements, as well as general operating practices. The interviews allowed the Planning Team to gain valuable insight for the development of this Programming Report to generate design data. Reference the “Key (Department Name) Needs” section under each Department for a list of the things they were interested in seeing develop within their department as Mountain Line grew.

- Administration – Reference Section 2.2.2
- Operations – Reference Section 2.2.3
- Fleet Maintenance – Reference Section 2.2.4
- Facilities Maintenance – Reference Section 2.2.5
- Information Technology – Reference Section 2.2.6

HDR met with the Operations, Maintenance, Administration, and Information Technology departments for programming interviews and facility operations to ensure that the functional requirements, including circulation and proximity relationships, are appropriately addressed in the Conceptual Design.

#### HDR Planning / Design Team

- Torsten Schmudde, Project Manager
- Ken Booth, Facility Design Specialist
- Kate Diamond, Design Principal
- BillieJo Deininger, Facility Designer

## 2.1.6 Acknowledgements

HDR would like to acknowledge the efforts and contributions of the Mountain Line team during the facility programming endeavor. Their enthusiastic and continued participation shall ensure the realization of the best Master Plan and Design conceivable.

- Anne Dunno, Capital Project Manager
- Heather Dalmolin, CEO / General Manager
- Danelle Knight, Human Resources Manager
- Josh Stone, Management Services Director
- Kate Morley, Deputy General Manager
- Jeremiah McVicker, Maintenance Manager
- Samuel Short, Safety Manager
- Jon Matthies, IT Manager
- Jim Wagner, Operations Director



- Robert Hilbers, Facilities Coordinator
- Mark Attenberger, Fleet Supervisor

## 2.2 Basis for Design

### 2.2.1 Introduction

The purpose of Section 2.2 - Basis for Design is to document and define the functional and operational requirements of the groups that will operate at the Kaspar Headquarters. This Basis for Design is important for developing the requirements and space needs for the facility. The understanding gained by HDR through the data sent by Mountain Line and programming sessions greatly influences the layout for the facility. A summary of operational requirements is included for each group.

This section includes functional requirements, staffing, vehicles maintained, and key planning needs for each group. The data in the tables represent existing conditions, and projected needs in the next 10 years and 20 years. HDR will use this information during the future planning and design efforts.

Reference the following spatial diagram from Appendix E for a better understanding of the current buildings and their program.

**Figure 2-2. Site Diagram**





## 2.2.2 Administration

### Function

The Administration team includes executive leadership, HR, finance, IT, planning, marketing, and customer service.

### Staffing

The current hours of operation for the Administration staff at the Kaspar Headquarters are from 8:00 a.m. to 5:00 p.m., Monday through Friday. The public lobby and customer service counter is closed from 12:00 p.m. to 1:00 p.m. for lunch.

Table 2-1 summarizes the staffing positions for Mountain Line Administration. The administrative staffing for the Kaspar master plan program will be greatly reduced because the Administration team is relocating to the Downtown Connection Center. Reference Section 2.2.6 Information Technology for more information on IT future expectations and growth. After the DCC is opened, the Kaspar Headquarters will no longer provide public access for customer service.

**Table 2-1. Administration Staffing**

Position	Existing Conditions	2028	2033	Master Plan 2043	Shift	Status
Accountant Technician II	1	0	0	0	Day	Full-time
CEO & General Manager	1	0	0	0	Day	Full-time
Executive Assistant / Clerk of Board	1	0	0	0	Day	Full-time
Deputy General Manager	1	0	0	0	Day	Full-time
Eligibility Specialist	1	0	0	0	Day	Full-time
Human Resources Intern	0.5	0	0	0	Day	Part-time
Human Resources Manager	1	0	0	0	Day	Full-time
Human Resources Specialist	1	0	0	0	Day	Full-time
Human Resources Technician	0.5	0	0	0	Day	Part-time
Management Services Director	1	0	0	0	Day	Full-time
Customer Service Representative	1	0	0	0	Day	Full-time
Marketing and Communications Director	1	0	0	0	Day	Full-time
Safety Manager	1	0	0	0	Day	Full-time
Capital Project Manager	1	0	0	0	Day	Full-time
Associate Transit Planner	1	0	0	0	Day	Full-time
Mobility Planner	1	0	0	0	Day	Full-time
Planning Intern (Student)	0.25	0	0	0	Day	Part-time

Position	Existing Conditions	2028	2033	Master Plan 2043	Shift	Status
Planning Intern (Montoya Fellowship)	0.5	0	0	0	Day	Part-time
Purchasing and Contracts Officer	1	0	0	0	Day	Full-time
Financial Analyst	1	0	0	0	Day	Full-time
Transit Planner	1	0	0	0	Day	Full-time
<b>Total</b>	<b>18.75</b>	<b>0</b>	<b>0</b>	<b>0</b>		

(All IT positions are Identified in Table 2-9)

### Key Administrative Needs

- Plan for most of the administrative and executive staff to relocate to the Downtown Connection Center.
- Evaluate the number of required offices at Kaspar HQ. During the recent COVID-19 pandemic, Mountain Line staff realized that not all staff need to work full-time in the office. Many staff can work from home occasionally for their task.
- The current administrative facility has an abundance of storage. Mountain Line is looking to transition to a paperless operation and reduce the need to store files.
- Provide a wellness room. Provide adequate space to accommodate several staff with equipment. Provide Mountain Line with some exercise and stretching equipment. Balance size of Kaspar wellness room with DCC programming.
- Provide a mother's room/quiet room with sink. Mother's room should be reasonably located to allow for visitor access. Breastfeeding mother should have priority over other staff for quiet room access.
- Staff identified future need at Kaspar (post-DCC construction) to have flexible space for administrative staff.
- Provide a smaller space than the current mail room for secure mailbox access or leave existing space as is.

## 2.2.3 Operations

### Function

The Operations team provides support for fixed route and paratransit services by driving, supervising, training operators, and scheduling transportation services

### Staffing

The current hours of operation for Bus Operations staff at the Kaspar Headquarters vary depending on which of the 9 routes an operator is driving, but are between 6:00 a.m. to 11:00 p.m., Monday through Friday and between 6:00 a.m. to 9:00 p.m., on weekends



and holidays. Table 2-2. Operations Staffing summarizes the current and projected staff for the Mountain Line Operations team.

Future staff hours may include a third shift due to span of service hours expansion impacting operations, fleet, and facility staff.

**Table 2-2. Operations Staffing**

Position	Existing Conditions	2028	2033	Master Plan 2043	Status
Operations Coordinator	1	2	2	3	Full-time
Operations Director	1	0	0	0	Full-time
Operations Manager	1	1	1	1	Full-time
Operations Supervisor	8	9	11	12	Full-time
Paratransit Operations Coordinator	1	0	0	0	Full-time
Transit Operator	53	63	76	100	Full-time
Trainer	2	2	2	2	Full-time
<b>Total</b>	<b>67</b>	<b>77</b>	<b>92</b>	<b>118</b>	

Source: Space Needs Program – Operations Table

## Bus Parking

Mountain Line currently parks their buses in Shop 0, Shop 2, and Shop 3. In Shop 0, typically 8 paratransit buses are parked requiring 5,500 sf. In Shop 2, there are three standard buses parked in approximately 2,000 sf. In Shop 2, there is dedicated space for parking some of non-revenue Fleet vehicles. Approximately 700 sf of space in Shop 2 is for facilities maintenance to store vehicles. In Shop 3, Mountain Line's Bus Storage building, buses are parked in 6 lanes in approximately 22,000 sf and accommodates parking for approximately 3 articulated buses and 23 standard buses.



**Figure 2-3. Bus Parking Diagram**



Mountain Line's interior parking is at full capacity triggering need to park a portion of fleet outside of the heated buildings. Mountain Line has five service trucks that they currently have dedicated exterior parking space available for.

The following table summarizes the current and projected bus types and quantities utilized by Operations.

**Table 2-3. Bus Fleet**

Vehicle Type	Existing Conditions	2028	2033	Master Plan 2043	Parking Size (feet)
Paratransit Unleaded Fuel	7	6	6	0	14 x 35
Paratransit Electric	0	1	3	12	14 x 35
Standard Hybrid	23	12	6	0	14 x 45
Standard Electric	0	14	26	42	14 x 45
Articulated Hybrid	6	4	3	0	14 x 70
Articulated Electric	0	2	6	10	14 x 70
<b>Total</b>	<b>36</b>	<b>39</b>	<b>50</b>	<b>64</b>	

Source: Space Needs Program – Enclosed Vehicle Parking Table



The following Table 2-4. Exterior Parking for Non-Revenue Fleet Vehicles summarizes the spare service vehicles Mountain Line currently uses to shuttle drivers for connections or lunch relief.

**Table 2-4. Exterior Parking for Non-Revenue Fleet Vehicles**

Vehicle Type	Existing Conditions	2028	2033	Master Plan 2043	Parking Size (feet)
Ford Goshen Shuttle Van	1	1	1	0	10 x 35
Ford Eldorado Shuttle Van	1	1	1	0	10 x 35
E-450 Eldorado Aerotech Shuttle Van	1	1	1	0	10 x 35
E-450 Eldorado Aerotech Shuttle Van	1	1	1	0	10 x 35
E-350 Eldorado Aerolite Shuttle Van	1	1	1	0	10 x 35
Shuttle Vehicle (EV)	0	0	0	5	10 x 35
<b>Total</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	

Source: Space Needs Program – Exterior Vehicle Parking Table

## Key Operational Needs

### *Operations Office Needs*

- Provide offices and support areas with insulated walls to create quiet spaces.
- Provide low maintenance operational spaces. Mountain Line has found it to be difficult to keep their floors clean and can be accommodated by using industrial material for their flooring. Mountain Line also recommended putting in matted puzzle piece flooring that is easy to remove and wash as need.
- Provide dispatch area for one paratransit and fitness for duty supervisor.
- Provide a Bus Simulator Training Room for supervisors and trainers to thoroughly prepare and train Transit Operators.

### *Exterior / Bus Storage Needs*

- Provide climate-controlled bus storage for all revenue vehicles to accommodate Mountain Line's current and future fleet for state of good repair.
- Provide exterior parking for non-revenue vehicles with preference for canopy covered parking.
- Evaluate the site vehicle circulation to ensure bus clearances are being met. Mountain Line is currently having difficulty maneuvering their fleet vehicles throughout the site. This needs to be addressed to accommodate future growth.
- Evaluate the access points to the site from Kaspar Drive and the driveway access. Mountain Line has found the current access points to be limited and cause congestion during peak times.

#### *Operations Office Areas to be Provided*

- Operations Coordinator – Private office with two chairs for visitors and computer station desk with file storage cabinet
- Operations Manager – Private office with two chairs for visitors and computer station desk with file storage cabinet

#### *Operations Support Areas to be Provided*

- Locker alcove with day lockers for bus operators to store personal items.
- Driver's lounge to accommodate the operations staff during breaks or in between routes. This should include a kitchenette, microwave, sink and a place to eat.
- Wellness Room to provide a space for exercising and stretching. Provide mats for when sitting on the ground. Provide a small set of weights of various sizes and 2-3 treadmills. This space does not need to be too large as there is a wellness room incorporated in the new DCC design concept.
- Provide a small storage room for the operations staff to store any training equipment, paper, pencils, notebooks, etc. out of the way.
- Operators training room with two Virtual Reality training simulators and a marker board, desk and chair for a trainer to teach during a simulation.

#### *Operations Shared Office Areas to be Provided*

- Provide two shared flex workstation spaces for the Operations Supervisors to efficiently work in the same space amongst one another and accommodate 2 Supervisors during a shift at one time. There will be two more workstations for Operations Supervisors at the DCC location available as well.
- Provide Mountain Line's two Trainers with a shared office including two workstations. Mountain Line doesn't expect to hire any additional trainers in the future, so one shared space will be plenty to accommodate future growth.

## 2.2.4 Fleet Maintenance

### Function

Fleet Maintenance is responsible for preventative maintenance and repairs including engine and transmission overhaul, tire, brake, battery, electronic, and minor body repair. Any major body repair is outsourced. Fleet integrates new IT technologies onto buses and manages the daily bus rodeo. In the future, fleet may share responsibility with operations for electric vehicle battery management.

### Staffing

The current hours of operation for the Fleet Maintenance staff at the Kaspar Headquarters is from 5:00 a.m. to midnight, Monday through Friday and 5:00 a.m. to 10:00 p.m., on the weekends. Table 2-4 Fleet Maintenance summarizes the current and projected Mountain Line Transit Fleet staff.

Future staff hours may include a third shift due to span of service hours expansion impacting operations, fleet, and facility staff.

**Table 2-5. Fleet Maintenance Staffing**

Position	Existing Conditions	2028	2033	Master Plan 2043	Status
Bus Detailer / Fueller	2.5	2	1	1	Full-time
Fleet Supervisor	1	1	2	2	Full-time
Maintenance Manager	1	1	1	1	Full-time
Mechanic	4	5	7	9	Full-time
<b>Total</b>	<b>8.5</b>	<b>9</b>	<b>11</b>	<b>13</b>	

Source: Space Needs Program – Maintenance Table

### Fleet Maintenance Vehicle Parking

The following table summarizes the current and projected parking requirements for Fleet and Facilities Maintenance. The service trucks utilized by Fleet Maintenance are counted in the Facility Maintenance Section.

Down Line / Ready Line are buses waiting to be repaired. In the future buses could be brought here for repair from other sites and need a place to park while they are waiting to be repaired. These buses are not usually spares, but buses that need maintenance or have been repaired.

**Table 2-6. Exterior Down Line / Ready Line Parking**

Vehicle Type	Existing Conditions	2028	2033	Master Plan 2043	Size (feet)
Down Line / Ready Line – Standard Bus	0	0	1	2	12 x 45
Down Line / Ready Line – Articulated Bus	0	0	1	2	12 x 65
<b>Total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>4</b>	

Source: Space Needs Program – Down Line / Ready Line Table

### Key Fleet Needs

- Provide new maintenance bays with drive-through capabilities, heated floors, natural daylight, and lifts with the ability to lift standard size and articulated sized buses.
- Provide tire storage to accommodate every bus having a backup set of tires. Mountain Line hopes to add approximately 23 more buses in the next 20 years, which would be almost 416 tires. This includes 64 back up tires for para-transit buses



(4/bus), 252 back up tires for standard buses (6/bus), and 100 tires for articulated buses (10/bus).

- Provide Fleet Maintenance with mobile platform equipment that allows them to safely access the top of buses when needed and can be moved out of the way when not. As Mountain Line incorporates more electrical buses into their fleet this will become necessary for accessing bus batteries.
- Provide Fleet Maintenance with a 1-ton Overhead Bridge Crane to help staff with lifting batteries out of the bus and putting them back in.
- Provide a Chassis Wash Bay in the mechanics area with necessary lift equipment to allow the undercarriage of the fleet vehicles to be cleaned.
- Provide electronic controlled fluid system/lubricants.
- Provide storage space for batteries.
- Plan flow of work, ease of access for parts, and equipment to work bays
- Digital tracking of lubrications
- Parts bay overhead door big enough door for delivery trucks.
- Ample storage for parts (shelving, draws, racks and bulk storage area)
- Eye wash/shower in the middle of the work area
- Library near work bays
- Room to properly approach doors (Parking lot area)/ pass through bays
- Ample amount of room in each bay for mechanics to work all sides of vehicles
- Bright Lighting and light-colored floors

#### *Fleet Maintenance Office Areas to be Provided*

- Fleet Supervisor Private office with two chairs for visitors and computer station desk with file storage cabinet
- Maintenance Manager Private office with two chairs for visitors and computer station desk with file storage cabinet

#### *Fleet Maintenance Shared Office Areas to be Provided*

- Provide Mountain Line Mechanics with a shared office space for all mechanics to use. Provide five flex workstations for Mountain Line's future nine mechanics to use as needed.

#### *Fleet Maintenance Office Support Areas to be Provided*

- Men's restroom with lockers for storing work clothes and a shower
- Women's restroom with lockers for storing work clothes and a shower

### *Repair Bays*

- Articulated (65') Bus Repair Bays – 20' x 80' drive-through bays with workbench, vehicle exhaust, bulk fluids, compressed air, electric outlets and with an overhead clearance of 19'-0"
- Standard (35') Bus Repair Bays - 20' x 50' drive-through bays with workbench, vehicle exhaust, bulk fluids, compressed air, electric outlets and with an overhead clearance of 19'-0"

### *Specialty Bay*

- Chassis Wash Bay – 25' x 80' to accommodate an articulated bus with a platform lift and necessary wash equipment.

### *Fleet Maintenance Shop Areas to be Provided*

- Common work area – dedicated area for industrial shop equipment, including grinder, drill press, hydraulic press, parts washing cabinet, and hose fabricating equipment.
- Tire shop – Shop to repair tires including a tire changer, tire balancer, and inflation cage.
- Electronics shop – A clean room to maintain electronic components on the bus and storage of electronic parts.
- Welding area – Area for welding components with a welding table, fume extraction arm, steel storage, and portable welding equipment
- Rebuild area – with workbenches and access to overhead crane for repairing engines and transmissions.
- Battery Shop – Room to diagnose and test batteries for the batteries that propel the buses.

### *Fleet Maintenance Storage Areas to be provided*

- Parts Storeroom – Storage for small parts in drawer cabinets and shelving units. Larger parts stored on pallet racks with forklift access with a minimum overhead clearance of 20' and access through overhead door to the exterior for deliveries
- Tire storage – Store 416 back up tires either by storing on the floor or with the use of tire carousels. Avoid the use of racks for the safety of the employees. Consider a tire carousel to safely store tire vertically instead of on the floor. A carousel can reduce the storage area by more than 50% by utilizing the volume of the area instead of the floor area.
- Lube/Compressor Room – Room for the compressed air delivery equipment and storage of new and used bulk fluids in tanks with a pumped delivery system to reels located in the repair bays
- Portable equipment storage -dedicated storage of mobile shop equipment

- Toolbox Storage – dedicated storage of extra-large mechanics toolboxes out of the workspace in the repair bays
- Functional space to use presses/drills (items under bullet point 1)

## 2.2.5 Facilities Maintenance

### Function

Facilities Maintenance is responsible for ongoing preventative maintenance and long-term rehabilitation of Mountain Line's facility assets including all buildings, exterior site, landscaping, snow removal and bus stops.

### Staffing

The current hours of operation for the Facilities Maintenance staff at the Kaspar Headquarters is from 5:00 a.m. to midnight, Monday through Friday and 5:00 a.m. to 10:00 p.m., on the weekends. Table 2-7. Facilities Maintenance Staffing summarizes the current and projected Mountain Line Facilities Maintenance staff.

Future staff hours may include a third shift due to span of service hours expansion impacting operations, fleet, and facility staff.

**Table 2-7. Facilities Maintenance Staffing**

Position	Existing Conditions	2028	2033	Master Plan 2043	Status
Facilities Coordinator	1	1	1	1	Full-time
Facilities Technician I	0	1	2	4	Full-time
Facilities Technician II	2	2	3	3	Full-time
Facilities Technician III	1	1	2	2	Full-time
<b>Total</b>	<b>4</b>	<b>5</b>	<b>8</b>	<b>10</b>	

Source: Space Needs Program – Maintenance Table

### Facilities Maintenance Vehicles

The following tables summarize the current and projected non-revenue vehicle types and quantities utilized by Facilities Maintenance.

**Table 2-8. Enclosed Parking for Facilities Maintenance**

Vehicle Type	Existing Conditions	2028	2033	Master Plan 2043	Size (feet)
Forklift	1	1	1	1	8 x 10
Tool Cat	2	2	2	2	8 x 10
Service Truck	8	8	9	10	10 x 25
Front End Loader	0	0	1	1	10 x 25
Trailer	1	1	1	1	12 x 35
<b>Total</b>	<b>12</b>	<b>12</b>	<b>14</b>	<b>15</b>	

Source: Space Needs Program – Enclosed Vehicle Parking Table

## Key Facilities Maintenance Needs

- Improve security fencing around maintenance and bus storage buildings. There are locations where fencing coverage could be improved.
- Evaluate the use of storage spaces to neatly accommodate different equipment in dedicated spaces. Mountain Line's maintenance team members hope to strongly incorporate this in the new addition to help them work as efficiently as possible.
- Provide additional storage to accommodate snowplow equipment so that during the rest of the year it can be out of the way.
- Most of the space in Shop 2 is dedicated to the facilities maintenance shop but is currently being used for storing vehicles as well which adds about another 700 sf of parking but, takes away space currently from the facilities maintenance team shop area. Provide Mountain Line with sufficient facilities shop space to accommodate future growth.
- Combine facilities equipment storage for efficiency and extended life. Currently equipment is distributed in Conex or outdoors.

### *Facilities Maintenance Office Areas to be Provided*

- Provide Facilities Coordinator with a small private office with a computer desk and file storage and two chairs for visitors.

### *Facilities Maintenance Shared Office Areas to be Provided*

Provide the following members of the facilities maintenance team a shared office space with three workstations to accommodate the staff growing to 10 total staff.

- Facilities Technician I
- Facilities Technician II
- Facilities Technician III

### *Facilities Maintenance Shop Areas to be Provided*

- Facilities Supply Storage – Provide Facilities Maintenance with enough storage to strategically place equipment, tools, snowplow equipment, and other shop items in an organized way to make it easy to find what they need.
- Facilities maintenance shop – Dedicated shop space for the facilities maintenance team to work in.
- Portable equipment storage – Area near the facilities maintenance shop that is dedicated to storing any portable equipment nearby, so the maintenance team has easy access and ability to use equipment conveniently as needed.
- Welding area – Area for welding components with a welding table, fume extraction arm, steel storage, and portable welding equipment

## 2.2.6 Information Technology

### Function

IT is responsible for assisting Administration and Maintenance with reporting and overseeing installation of software and computer maintenance.

### Staffing

The current hours of operation for the IT staff at the central facility are from 8:00 a.m. to 5:00 p.m., Monday through Friday. Table 2-9. Information Technology Staffing summarizes the current and projected Mountain Line IT staff.

Future staff hours may include a third shift due to span of service hours expansion impacting IT staff. The IT staff and programming needs will be moving to the Downtown Connection Center and will only require a few flex spaces at the Kaspar Headquarters.

**Table 2-9. Information Technology Staffing**

Position	Existing Conditions	2028	2033	Master Plan 2043	Shift	Status
Document Control Specialist	0.5	0	0	0	Day	Part-time
Information Technology Intern	0.5	0	0	0	Day	Part-time
Information Technology Manager	1	0	0	0	Day	Full-time
Information Technology Specialist	1	0	0	0	Day	Full-time
Information Technology Technician	1	0	0	0	Day	Full-time
<b>Total</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>		

Source: Space Needs Program – IT Table

### Key Information Technology Needs

- There is no plan to relocate the existing Server Room.
- Mountain Line IT department has learned they work well with flex spaces rather than separated offices. They occasionally work together in private chat rooms for virtual meetings. They will need to be provided with the necessary equipment to hook computers up to screens and collaborate without disrupting the rest of the office space.

### *Information Technology Administrative Office Areas to be Provided*

- Since Mountain Line IT department is moving to the DCC location, there will only need to be two flex office spaces at the Kaspar Headquarters location including a computer desk and file storage and two chairs for visitors. Have the desk prepared with two screens and proper laptop HDMI connections.

#### *Information Technology Office Support Areas to be Provided*

- Server Room – Mountain Line will continue use of the existing server room at the Kaspar Location and provide space for another server room at the DCC location.
- Storage Room – small storage area for extra equipment that isn't in use or back up equipment.

### 2.2.7 Shared Support Areas

Each of the buildings will have various shared support areas that may serve all departments. For concept development, the goal is to organize functional departments into either different buildings and/or strategically located within a building for the functions that are staying at Kaspar Headquarters.

#### *Operations & Shared Spaces*

- Provide for two office flex spaces for occasional administrative or IT staff to work when staff visit from the DCC.
- Conference / meeting room for about 18 people with audio visual equipment for sharing presentation and web conferences (about 25 sf / person in a 450 sf room)
- Two gender neutral restrooms
- Printer / copy / storage area for storage of office supplies
- Mechanical Closet (should be able to utilize the existing mechanical room unless the Admin Building is not repurposed)
- Janitor Closet with mop sink and storage for cleaning cart, paper, and cleaning supplies.
- Electrical Room (should be able to utilize the existing mechanical room unless the Admin Building is not repurposed)
- Reconfigure the current common space to allow more space for Transit Operators to have a quiet space, entertain themselves, or relax in between shifts as some of them don't have the opportunity to go home or do this in a traditional way.
- Provide a quiet room, separate from mother's room, that allows Transit Operators to rest between shifts if they would like, sometimes even a quick 20-minute nap is all someone needs to re-energize. This space could be sized and designed to allow staff the option to stay overnight in case of emergencies.
- Shared use office space for administrative staff that have business at Kaspar HQ.

#### *Maintenance*

- Mechanical Room
- Janitor Closet with mop sink and storage for cleaning cart, paper, and cleaning supplies.
- Electrical Room

- Electrical Mezzanine – space for an emergency generator and all BEB charging equipment to be located. This could be located either with the repair bays or with bus storage.
- Provide backup generator for EV system (long term).
- Two gender neutral Restrooms

## 2.2.8 Public & Employee Parking

### Function

The following tables summarize the current and projected miscellaneous vehicle parking needs utilized by employees, visitors, and electric vehicles at Mountain Line.

To estimate the needed employee parking on site the number of spaces is calculated by including the total number of Bus Operations office staff, IT staff, Fleet Maintenance staff, Facilities Maintenance staff and the peak number of buses that are in service. The peak service is assumed to be the total number of buses less the spare ratio of 24%.

The existing employee parking cannot be impacted until future DCC long term parking solution is implemented. Once the DCC facility is open, the administrative staff may use the Kaspar parking as an option to park and ride to DCC.

**Table 2-10. Employee / Visitor Parking**

Vehicle Type	Existing Conditions	2028	2033	Master Plan 2043	Size (feet)
Employee/Visitor Parking	76	81	87	98	9 x 18
Accessible Parking	4	4	4	4	13 x 18
Clean Air / Electric Vehicle Parking	4	5	6	8	9 x 18
<b>Total</b>	<b>84</b>	<b>90</b>	<b>97</b>	<b>110</b>	

Source: Space Needs Program – Employee / Visitor Parking Table

## 2.3 Space Needs Program

### 2.3.1 Introduction

This section presents the Space Needs Program for the Kaspar Headquarters Transit Facility. The Space Needs Program illustrates the space requirements for efficient operations. The program is summarized at the end of this section, which includes projected square footage needs for building areas and exterior areas. These projected space needs are subtotaled to include site access, landscaping, and setbacks for total site acreage requirements.

## Space Needs Office Areas

### Staffing

Facility staffing levels are crucial to planning efforts when determining the number of parking spaces, size of support facilities, and developing occupancy levels. The table below is the summary of facility staffing levels for each group, initially for a current fleet and a future projected fleet. These staffing levels were taken directly from interview sessions and HDR's knowledge of similar facilities. Refer to Section Two - Basis for Design and Appendix A - Space Needs Program for a more detailed breakdown of each department's staff.

**Table 2-11. Kaspar Headquarters Staffing Summary**

Position	Existing Conditions	2028	2033	Master Plan 2043	Shift	Status
<b>Kaspar Headquarters</b>						
Administration	18.75	0	0	0	Day	Varies
Operations	67	77	92	118	Varies	Varies
Maintenance	12.5	14	19	23	Varies	Varies
Information Technology	4	0	0	0	Day	Varies
<b>Total</b>	<b>102.25</b>	<b>91</b>	<b>11</b>	<b>141</b>		

Source: Space Needs Program – Table 3. Staffing Summary

## 2.3.2 Vehicle Parking Summary

The number of vehicles, equipment, and employee vehicle quantities is essential to determining parking requirements. Mountain Line Kaspar Headquarters will also be responsible for providing parking for the DCC employees at their location for a park and ride because there is not employee parking available at the DCC location. The following table summarizes different vehicle types that currently have parking and will need parking in the future at Kaspar Headquarters. It is planned that all buses will be located at the Kaspar Facility. For a more detailed list of vehicles please refer to the Space Needs Program.

### Parking Types

- Enclosed Heated – This means that the vehicles will have a space designated inside a bus storage facility that is heated.
- Exterior parking – Vehicle parking that is secured within the gates of the facility but is located outside.
- Outside parking – Vehicle parking that is located outside and not within the gates of the facility.

### Vehicle Types

- Non-Revenue Vehicles – Fleet vehicles that are currently not in use.



- Revenue Vehicles – Fleet vehicles that are currently being used for public transit operations.
- Public – Public vehicles are used by the Mountain line staff, the DCC staff, visitors, electrical parking, and the rest of the general public vehicles that would need space.

**Table 2-12. Overall Total Parking Requirements**

Vehicle Type	Existing Condition	2028	2033	Master Plan 2043	Parking Type
Bus Operations	42	45	55	73	Heated Enclosed
Fleet Maintenance	0	0	2	4	Exterior Secure
Facilities Maintenance	12	12	14	15	Heated Enclosed
Employee/Visitor	84	90	97	110	Exterior

Source: Space Needs Program – Enclosed and Exterior Parking Tables

### 2.3.3 Space Standards

Space standards were applied to the Space Needs Program and generally apply to the Offices, Shops, Bays, and Vehicle Parking Areas. Area requirements in Shops and Storage Areas were derived from functional requirements and equipment space needs. The space standards listed below were utilized to develop the facility program and overall area requirements. The space standards are based on functional needs and requirements established through the design of other facilities, rules of thumb, and specific requirements of each functional group. The following table (Table 2-13. Space Standards) is a list of area standards for the following spaces.

**Table 2-13. Space Standards**

Area	Size
<b>Office</b>	
Private Office 1	144 SF office
Private Office 2	120 SF office
Shared Office 1	100 SF office
Shared Office 2	250 SF workstation
Shared Office 3	360 SF workstation
<b>Shop</b>	
Bus Repair Bay - Standard	1,200 SF (20 x 50)
PM/Inspection Bay - Standard	1,200 SF (20 x 50)
Bus Repair Bay - Articulated	1,600 SF (20 x 80)
PM/Inspection Bay - Articulated	1,600 SF (20 x 80)
Chassis Wash Bay	2,000 SF (25 x 80)

**Table 2-13. Space Standards**

Area	Size
<b><i>Parking</i></b>	
35-foot Transit Bus	630 SF (14 x 45)
60-foot Articulated Bus	980 SF (14 x 70)
Employee Vehicles	162 SF (9 x 18)
Visitor Vehicles	162 SF (9 x 18)
Accessible Parking	234 SF (13 x 18)

### 2.3.4 Circulation Factors

The space requirements shown for each function are net usable area. By using the urban design approach to this development of the facility, the HDR Planning Team hopes to minimize the amount of circulation necessary for an efficient facility. There are three Circulation Factors utilized in the Space Needs Program. These factors are Interior or Building Circulation, Parking Circulation, and Site Circulation Factor.

#### Interior of Building Circulation

This factor is applied to the program as a percentage of the total building square footage. It accounts for miscellaneous building spaces such as hallways, stairwells, custodial closets, mechanical, plumbing, and electrical rooms, wall thickness, structure (Circ/Mech/Elec/Struct - Net:Gross), and access requirements. The following is a list of the factors (in general) that have been applied to the program:

Administrative Office Areas	25%
Training and Education Area	25%
Maintenance Office Areas	25%
Maintenance Support Areas	25%
Shop and Bay Areas	20%

#### Parking Circulation

This factor is included to account for the drive aisles, walkways, islands, and other areas created by site and access inefficiencies. This factor can vary from 15 to 100 percent of the actual space occupied by a vehicle. For this project the following factors were applied:

Vehicle Parking Areas	100%
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#### Site Circulation Factor

This factor is also applied to the program as a percentage of the total program square footage. It accounts for areas around buildings, site drive aisles, building access, and site access. For new construction, a 100 percent factor is normally applied to account for all site inefficiencies. As such, the better the site conditions, access, easement, etc., the more efficient the site layout can become, reducing this factor to as low as 50 percent.

### 2.3.5 Space Needs Program and Summary

A summary of the Space Needs Program for the Kaspar Headquarters is provided in Figure 2-4. Space Needs Program Summary. This summary table includes projected square footage needs for building areas, covered areas, exterior areas, and parking areas. These projected space needs are subtotaled into net square footage requirements and converted to the total site acreage requirements for the redeveloped facility and any potential residual land area. Site circulation, landscaping requirements, and total acres required are also shown.

The Space Needs summary includes projected square footages for the proposed new additions to the current facility.

The detailed Space Needs Program Summary begins with the identification of each space by name and a space standard (if applicable). The following columns represents the projected staff and spaces required to accommodate the fleet inclusively and operation for the Master Plan build out.

The Space Needs Program is used by the HDR Planning Team to develop site master plans and conceptual building plans for the new facilities to be developed in a future design charrette.

Figure 2-4. Space Needs Program Summary

Summary - Space Needs Program 10/28/2022	EXISTING			2028			2033			2043			Remarks
	Qty.		Area (SF)	Qty.		Area (SF)	Qty.		Area (SF)	Qty.		Area (SF)	
	Staff	Space		Staff	Space		Staff	Space		Staff	Space		
BUILDING AREAS													
BUS OPERATIONS	101		19374	82		7,445	100		9,571	128		10,962	
FLEET MAINTENANCE	0		2710	9		17,169	11		17,169	13		22,264	
FACILITIES MAINTENANCE	0	12	3970	5	12	5,783	8	14	7,134	10	15	8,117	
ENCLOSED BUS STORAGE		39	24445		40	37,476		50	46,019		68	58,711	(10) ARTICS + (42) STANDARD + (12) PARATRANSIT
BUSH WASH BUILDING	0		2700			2,700			2,700			2,700	
TOTAL BUILDING AREAS	101.25	51	53,199	96	52	70,573	119	64	82,593	151	83	102,754	
EXTERIOR AREAS													
MISCELLANEOUS EXTERIOR AREAS			3,430			5,145			8,708			10,830	
EXTERIOR NON-REV VEHICLE PARKING		5	1,750		5	1,750		5	3,500		5	3,500	
DOWN LINE / READY LINE		0	0		0	0		2	2,640		4	5,280	
EMPLOYEE / VISITOR PARKING		84	28,896		90	29,736		97	32,004		110	36,216	MAINT. (23) + BUS OPS (16) + PEAK PULLOUT (54) + VISITOR/ELEC/ADA
TOTAL EXTERIOR AREAS		89	34,076		95	36,631		104	46,852		119	55,826	
SUBTOTAL ALL BUILDING AREAS			87,275			107,204			129,445			158,580	
SITE AREAS													
LANDSCAPING - 20%			40000			21,441			25,889			31,716	
STORMWATER - 15%			40000			16,081			19,417			23,787	
SETBACKS - 15%			0			16,081			19,417			23,787	
SITE CIRCULATION - 50%			80000			53,602			64,722			79,290	
SUBTOTAL ALL SITE AREAS			160,000			107,204			129,445			158,580	
GRAND TOTAL ALL AREAS			247,275	0		214,407	0		258,890	0		317,160	
	Acres:	5.68		Acres:	4.92		Acres:	5.94		Acres:	7.28		

## 3 O&M Life Cycle Costing

### 3.1 Introduction

The purpose of Section 3 – O&M Lifecycle Costing – is to outline potential impacts to operational and maintenance costs, and qualify the benefits and risks associated with primary design strategies being recommended in the Master Plan.

The existing Kaspar site includes six facilities and a site that were constructed at various times and require maintenance to keep operational.

- Shop 0 – Administration/Operations/Bus Maintenance/Bus Storage
- Shop 1 – Bus Maintenance
- Shop 2 – Facilities Maintenance/Bus Storage
- Bus Wash
- Shop 3 – Bus Storage/Training
- Fuel Facility
- Site – Fencing/Gates/Landscape/Snow removal

### 3.2 Methodology

To predict the operations and maintenance cost of the master planned facility, a review of the costs to maintain the existing is a good predictor.

Mountain Line provided information about the different maintenance contracts that are needed to maintain these facilities.

- Snow Removal – Storm event dependent
- Pest Control – Quarterly maintenance
- Carpet/Floor Cleaning – Annual maintenance
- Sand/oil Separator – Quarterly maintenance (sometimes less frequently)
- Boiler Maintenance (Shop 3) – Annual maintenance
- Floor Heating (Shop 3) – Annual maintenance
- Fire Extinguishers – Annual maintenance
- Fire Suppression/Alarm EMCS (Shop 3 & Bus Wash) – Annual maintenance
- Solar System – Annual maintenance
- Overhead Doors – Annual maintenance

In addition, Mountain Line provided data regarding the utility costs that affect the operation costs of the existing facilities.

- Water – City of Flagstaff



- Gas - Unisource Energy Services
- Power – Arizona Public Service

### 3.3 Master Plan Facility Changes

The Life Cycle Costs are based on the selected master plan Concept A. The future facility has been planned to accommodate the growth in buses and improvements to operations and maintenance at the facility. The following identify the changes to the facility.

#### Operations Building

- Improve facilities for operator comfort
- Elevator access to multi-story facility

#### Bus Maintenance

- Consolidation of functions into one space
- Ability to maintain articulated buses in the shop
- Improved working functionality with access to roof of bus

#### Bus Storage

- Wider parking lanes
- More buses stored indoors

#### Fuel/Wash

- Reduced use of diesel fuel system
- More frequent use of the bus wash with additional buses

#### Site

- Underground stormwater system
- Parking Structure

### 3.4 Impacts

The list of potential impacts based on the new master plan are listed below with their possible benefits or risk.

**Table 3-1. Impacts**

Facility Change	Impact	Measure	Benefit	Risk
Operations Improvement	Productivity	Training Cost	Retention	No
Elevator	Maintenance	Cost	No	Higher Cost
Consolidated Maintenance	Productivity	Labor Cost	Efficiency	No
Articulated Bus Repair Bays	Energy	Cost	Lower Cost	No

**Table 3-1. Impacts**

Facility Change	Impact	Measure	Benefit	Risk
Articulated Bus Repair Bays	Productivity	Labor Cost	Efficiency	No
Bus Roof Access	Productivity	Labor Cost	Efficiency	No
Wider Bus Parking Lanes	Productivity	Labor Cost	Efficiency	No
More Indoor Bus Parking	Bus Lifespan	Cost	Longer Life	No
Less Diesel Fuel	Energy	Cost	Cost Saving	No
More Frequent Use of Wash	Water Usage	Cost	No	Higher Cost
More Frequent Use of Wash	Wear	Cost	No	Higher Cost
Underground Stormwater	Maintenance	Cost	No	Higher Cost
Parking Structure	Maintenance	Cost	No	Higher Cost

## 3.5 Current Costs

The existing Kaspar Facility is approximately 53,000 square feet of operations, maintenance, and bus storage. Facilities Maintenance staff is currently four staff to maintain the facility. Maintenance labor costs at the facility in 2021 totaled 439 hours. The average salary for a Mountain Line maintenance technician is \$44,464 and projected hours per year of 1,600 hours equates to an hourly rate of \$27.90 per hour.

Total approximate maintenance labor costs in 2021 were \$12,250.

The non-labor costs for utilities and service contracts include the following items:

- Janitorial / Deep clean floor
- HVAC Maintenance
- General Repairs
- Water
- Sewer
- Electricity
- Telecommunications
- Recycling/Waste Removal
- Pavement Maintenance (service contract)
- Oil/Water Separator Maintenance
- Photovoltaic Panel Maintenance & Cleaning
- Utility Rates
- Materials and Supplies



The following table presents the estimated annual operations and maintenance costs for 2021.

**Table 3-2. Kaspar 2021 O&M Costs Summary with Labor**

Facility Costs	Annual Cost	Notes
Janitorial/Deep clean floors	\$49,816	
HVAC Maintenance	\$1,470	No contract repairs only
Equipment Maintenance	\$ -	Included in General Repairs
Lighting/Lamp Replacement	\$ -	Included in General Repairs
General Repairs	\$ 14,916	Not including parts
Water	\$9,574	
Sewer	\$815	
Electricity	\$37,162	
Telecommunications	\$24,076	
Recycling/Waste Removal	\$3,189	
<b>Total</b>	<b>\$141,018</b>	
<b>Site Costs</b>		
Pavement Maintenance (service contract)	\$2,683	
Signage and Markings	\$ -	No Contract
Fence & Gates Annual Maintenance	\$ -	No Contract
Exterior Lighting	\$ -	No Contract
Landscape/Irrigation Maintenance	\$ -	No Contract
Oil/Water Separator Maintenance	\$3,905	As needed service (average annual cost)
Underwater Stormwater Storage Maintenance	\$ -	No Contract
Photovoltaic Panel Maintenance & Cleaning	\$1,820	
<b>Total</b>	<b>\$8,408</b>	
<b>Labor Costs</b>	<b>\$12,250</b>	
<b>Total O&amp;M Costs with Labor</b>	<b>\$161,677</b>	

## 3.6 Projected Costs

The future Kaspar Facility will be a much larger facility (approximately double the building area) than the current facility and is planned to include additional Facilities Maintenance staff (approximately 10 staff) to maintain the facility. In addition, it is anticipated that there will be additional service contracts to maintain some of the new systems added to the facility.

The values for the O&M costs are determined by the average salary of the FM staff and the following estimated items:

- Service Contracts
- Utility Rates
- Materials and Supplies

### 3.6.1 Operations

For the Operations area of the building the cost table included the following items.

- Janitorial Services (service contract)
- Routine Deep Clean/Floors (service contract)
- HVAC Maintenance (service contract)
- Equipment Maintenance
- Lighting/Lamp Replacement
- General Repairs
- Water
- Sewer
- Natural Gas
- Electricity
- Telecommunications
- Recycling/Waste Removal

### 3.6.2 Bus Storage

For Bus Storage the cost table included the following items.

- HVAC Maintenance (service contract)
- Equipment Maintenance
- Lighting/Lamp Replacement
- General Repairs
- Water
- Sewer

- Natural Gas
- Electricity

### 3.6.3 Bus Wash

For Bus Wash the cost table included the following items.

- HVAC Maintenance (service contract)
- Equipment Maintenance
- General Repairs
- Bus Wash Water
- Sewer
- Natural Gas
- Electricity

### 3.6.4 Bus Maintenance

For Bus Maintenance the cost table included the following items.

- Routine Deep Clean/Floors
- HVAC Maintenance (service contract)
- Equipment Maintenance
- Lighting/Lamp Replacement
- General Repairs
- Parking Deck Pavement Maintenance (Sweeping) (service contract)
- Parking Deck Signage and Markings (service contract)
- Parking Deck Exterior Lighting (service contract)
- Water
- Sewer
- Natural Gas
- Electricity

### 3.6.5 Facilities Maintenance

For the Facilities Maintenance Buildings the cost table included the following items.

- HVAC Maintenance (service contract)
- Equipment Maintenance
- Lighting/Lamp Replacement
- General Repairs

- Water
- Sewer
- Natural Gas
- Electricity

### 3.6.6 Site Maintenance

For site maintenance the cost table included the following items.

- Pavement Maintenance (service contract)
- Signage and Markings (service contract)
- Fence & Gates Annual Maintenance (service contract)
- Exterior Lighting (service contract)
- Landscape/Irrigation Maintenance (service contract)
- Oil/Water Separator Maintenance (service contract)
- Underwater Stormwater Storage Maintenance (service contract)
- Canopy Maintenance & Cleaning
- Photovoltaic Panel Maintenance & Cleaning

### 3.6.7 Projected O&M Cost Summary

The following table presents the estimated annual costs for operations and maintenance costs in 2022 dollars.

**Table 3-3. Kaspar Projected O&M Costs Summary with Labor**

O&M Function	Annual Labor Cost	Other Annual Costs
<b>Operations Building</b>		
1.0 Building Maintenance	\$3,335	\$62,500
2.0 Utilities	--	\$63,538
<b>Bus Storage Building</b>		
1.0 Building Maintenance	\$3,335	\$19,500
2.0 Utilities	--	\$59,292
<b>Service Facility</b>		
1.0 Building Maintenance	\$2,223	\$3,500
2.0 Utilities	--	\$4,630
<b>Maintenance Building</b>		
1.0 Building Maintenance	\$3,335	\$13,500
2.0 Utilities	--	\$28,167
3.0 Parking Deck Maintenance	--	\$8,800

**Table 3-3. Kaspar Projected O&M Costs Summary with Labor**

O&M Function	Annual Labor Cost	Other Annual Costs
<b>Facilities Maintenance Building</b>		
1.0 Building Maintenance	\$3,335	\$5,000
2.0 Utilities	--	\$6,852
3.0 Site Maintenance	\$1,112	\$23,900
<b>Totals</b>		
<b>Totals</b>	<b>\$16,674</b>	<b>\$299,180</b>
<b>Annual O&amp;M Costs</b>	<b>--</b>	<b>\$315,854</b>

## 4 Phasing Plan

### 4.1 Recommendations

The 20-year growth horizon for Mountain Line indicates that the fixed route bus fleet will be growing from 29 to 52. The paratransit fleet will be grown from 7 buses to 12 buses by 2043. The Kaspar Headquarters facility is currently at maximum capacity to store any additional buses and the Mountain Line does not have other site options to store buses.

HDR recommends that Mountain Line move forward with Concept A developed during the design master planning process. Bus operations and maintenance will need to continue during construction at this site to complete the Kaspar Facility Master Plan. To construct the facility, construction will need to be completed in two phases. Additionally, the recent upgrade of the Federally funded Administrative and Operations areas of Shop 0, and limited available funding for the facility construction through grants and matching funds factor into the project to be constructed in two phases.

The new maintenance facility is needed immediately to replace the current and undersized in limited function and indoor heated bus storage is also at capacity in Shop 2 and Shop 3. It is recommended to begin design in 2023 for the design of the whole project and start construction for the Phase 1 maintenance facility in spring of 2024.

According to timeline for the bus fleet growth (see timeline below), additional heated bus storage will be required beyond the Phase 1 capacity by 2024 and it is recommended that construction for Phase 2 begin in the Spring of 2026.

**Figure 4-1. Phasing Plan**

		Phasing Plan																								
Phase	Curr.	PH 1 Design/Const.				PH 2 Const.		Occupy Phase 2																		
Year	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043				
Standard Buses Hybrid	23	21	19	16	13	10	7	4	12	6	6	6	6	6	4	4	4	4	2	2	2	0				
Articulated Buses Hybrid	6	6	6	6	6	6	6	6	5	4	3	3	3	3	3	2	2	1	1	1	1	0				
Standard Buses - EV	0	2	4	8	11	16	19	22	16	20	24	26	26	29	29	32	32	35	35	38	38	42				
Articulated Buses - EV	0	0	0	0	0	0	0	0	1	4	4	6	6	6	6	7	7	8	8	9	9	10				
Subtotal Fixed Route	29	29	29	30	30	32	32	32	34	34	37	41	41	44	42	45	45	48	46	50	50	52				
Paratransit Buses (Gas)	7	7	6	6	5	5	5	4	4	4	4	3	3	3	2	2	2	1	1	0	0	0				
Paratransit Buses - EV	0	0	1	1	2	2	2	3	4	4	4	5	5	6	7	8	9	10	10	12	12	12				
Subtotal Paratransit	7	7	7	7	7	7	7	7	8	8	8	8	8	9	9	10	11	11	11	12	12	12				
Total Bus Fleet	36	36	36	37	37	39	39	39	42	42	45	49	49	53	51	55	56	59	57	62	62	64				

Assumptions:

1. Current bus parking capacity: 25 buses in Shop 3 (19 standard/6 articulated); 3 standard buses in Shop 2; 1 rotating bus in Shop 1; 7 paratransit in Shop 0
2. Future Phase 1 Maintenance Bays can park 4 standard buses
3. Trigger for Phase 2 is two expansion buses AFTER maintenance bays need bus storage



## 4.2 Phasing

### 4.2.1 Phase 1

Begin the facility design in 2023 and start demolition and construction in the spring of 2024 and wrap up construction by the fall of 2025.

- New six-bay Maintenance Facility with a mezzanine (8 paratransit buses can be stored in two of the repair bays and chassis wash bay) – 28,505 sf
- Renovation of the Operations Area – 10,822 sf
- New rooftop employee parking and ramp (55 spaces) – 18,720 sf
- New site wall and paving near Bus Wash & Shop 3 (recommended, but could be deferred to phase two if articulated buses are circulated through Shop 3) – 3,753 sf
- New pavement access to the Maintenance Facility – 29,000 sf

### 4.2.2 Phase 2

Start demolition and construction in the spring of 2026 and wrap up construction by the fall of 2027

- New Bus Storage for 4 articulated, 27 standard buses and 12 paratransit buses – 50,809 sf
- New 2-Story Bus Operations – 16,340 sf
- New rooftop employee parking (57 spaces) – 19,344 sf
- Renovated Shop 1 for Facilities Maintenance use – 2,710 sf
- New pavement access to the Maintenance Facility – 10,600 sf

Concept A Phasing Plans for Kaspar Headquarters Facility Master Plan.

## 4.3 Concept A Phase One

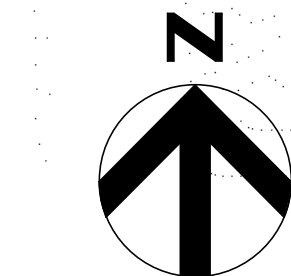




A-01

CONCEPT A

1" = 50'-0"





A-02

CONCEPT A -  
PHASE ONE /  
LEVEL ONE

1" = 50'-0"

EXISTING TO REMAIN

BUS STORAGE - 24,445 SF
BUS OPERATIONS - 1,700 SF
BUS WASH BUILDING - 2,700 SF
FACILITIES MAINTENANCE - 3,970 SF
FLEET MAINTENANCE - 2,710 SF

EXISTING TO BE RENOVATED

BUS OPERATIONS - 10,700 SF
----------------------------

PHASE ONE / LEVEL ONE

FLEET MAINTENANCE - 21,220 SF
NEW PAVEMENT - 30,000 SF





A-03

CONCEPT A -  
PHASE ONE /  
LEVEL TWO

1" = 50'-0"

PHASE ONE / LEVEL TWO  
FLEET MAINTENANCE - 6,240 SF



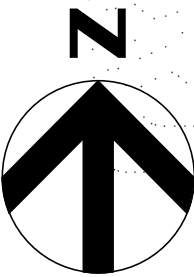


A-04

CONCEPT A -  
PHASE ONE /  
LEVEL THREE

1" = 50'-0"

PHASE ONE - LEVEL THREE
EMPLOYEE PARKING - 18,720 SF
RAMP - 5,900 SF





## 4.4 Concept A Phase Two



A-05

CONCEPT A -  
PHASE TWO /  
LEVEL ONE

1" = 50'-0"



EXISTING TO REMAIN	
BUS STORAGE - 24,445 SF	
BUS OPERATIONS - 1,700 SF	
BUS WASH BUILDING - 2,700 SF	
FACILITIES MAINTENANCE - 3,970 SF	

EXISTING TO BE RENOVATED	
FACILITIES MAINTENANCE - 2,710 SF	

PHASE TWO / LEVEL ONE	
BUS OPERATIONS - 3,800 SF	
BUS STORAGE - 26,364 SF	
NEW PAVEMENT - 10,600 SF	



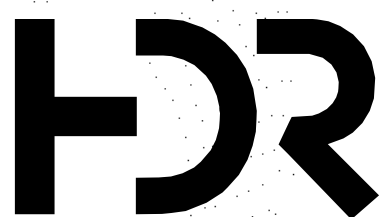
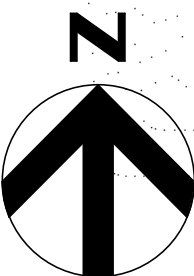


A-06

CONCEPT A -  
PHASE TWO /  
LEVEL TWO

1" = 50'-0"

PHASE TWO / LEVEL TWO  
BUS OPERATIONS - 10,800 SF





A-07

CONCEPT A -  
PHASE TWO /  
LEVEL THREE

1" = 50'-0"

PHASE TWO / LEVEL THREE	
BUS OPERATIONS	- 10,800 SF
EMPLOYEE PARKING	- 19,344 SF





## 5 Vacant Land Feasibility Study

### 5.1 Introduction

Mountain Line staff and the HDR team met with representatives from the City of Flagstaff to better understand whether the property to the north of the existing campus could be effectively used for expanded operations and maintenance facilities.

**Table 5-1. City of Flagstaff Comments**

	Question	Answer
1	Given the fact that Mountain Line owns the property on both sides of the proposed extension of Linda Vista, would the City consider abandoning the extension and allow Mountain Line to expand directly to the north with contiguous secure facilities?	NO. The City Engineer requires the extension of Linda Vista to meet the required traffic/evacuation plans for the City. While the timing of the construction of that extension is unknown, maintaining the clear easement is required for a development application on the property not a function of the lot line modification.
2	If Mountain Line still wished to pursue the use of the property north of the future Linda Vista roadway, what would be required from a planning and land use perspective?	A complete Zone Change from multi-family Residential to Highway Commercial would be required. Rezoning would likely be controversial since the adjacent land use is residential. It would take a minimum of 1 year + to complete rezoning with higher risk of not obtaining rezoning approval. .
3	If Mountain Line choses to proceed with changes to the existing Kaspar headquarters site without the north site, what would be the process to obtain approvals?	Given the scale of the proposed masterplan changes, Mountain Line will need to go through a full up-dating of the CUP prior to submitting any new phase of development to the building Department. One concern that will need to be addressed is the proposed Concept A will nearly remove all previously required landscape resources (trees/shrubs) to accommodate the programming.
4	If Mountain Line were to submit for a lot line adjustment to tie the wooded triangle at the northwest corner of the site south of the Linda Vista Easement part of the project site in order to preserve those natural resources to compensate for the loss of existing trees, would that be a viable solution?	Probably. Until there is a formal submittal, it is impossible to verify if that represents sufficient Resource protection. Also, the Planning Department and/or Commission reviewing the proposed CUP and new boundaries would need to confirm that the revision confers the industrial zoning automatically. In any case this would likely be non-controversial and much more palatable for the community.

Given this input, staff instructed HDR to focus on finding a master plan solution that did not rely on the northern site. The recommended Concept A proposes vertical development that optimizes the use of the existing Kaspar site still respecting the height limitations of the highway commercial zoning. As noted in the Recommendation Section this will require both the Lot Line Adjustment and an updated CUP to move forward with the Concept A Master Plan.

## 5.2 Concept C





C-01

CONCEPT C  
1" = 50'-0"

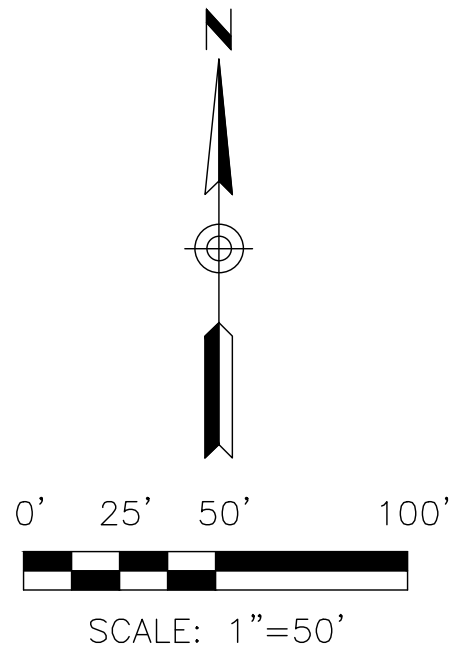




## 5.3 Lot Modification Study



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1626 North Litchfield Road,  
Suite 150  
Goodyear, AZ 85395  
Phone: 623.935.2258  
Contact: Jeff McBride, P.E.

MOUNTAIN LINE  
KASPAR HEADQUARTERS MASTER PLANNING  
3773 N KASPAR, FLAGSTAFF, AZ, 86004

SITE MAP

Issued for	Rev.	Date

Project No. 1122018  
Designed: XXX Drawn: XXX Checked: XXX

Drawing Title  
SITE

Dwg No.  
C1.0





C-03

CONCEPT C -  
PHASE TWO /  
LEVEL ONE

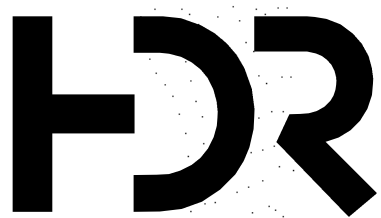
1" = 50'-0"



C-04

CONCEPT C -  
PHASE TWO /  
LEVEL TWO

1" = 50'-0"





## 6 Concept Plans

### 6.1 Existing Site Plan





EXISTING  
SITE PLAN

1" = 60'-0"



## 6.2 Concept A

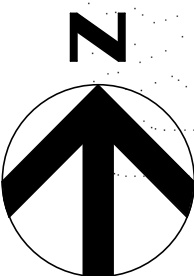




A-01

CONCEPT A

1" = 50'-0"





**A-02**

# CONCEPT A - PHASE ONE / LEVEL ONE

**1" = 50'-0"**

## EXISTING TO REMAIN

**BUS STORAGE - 24,445 SF**

**BUS OPERATIONS - 1,700 SF**

**BUS WASH BUILDING - 2,700 SF**

**FACILITIES MAINTENANCE - 3,970 SF**

**FLEET MAINTENANCE - 2,710 SF**

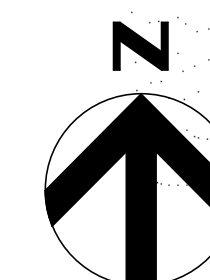
**EXISTING TO BE RENOVATED**

**BUS OPERATIONS - 10,700 SF**

## PHASE ONE / LEVEL ONE

**FLEET MAINTENANCE - 21,220 SF**

**NEW PAVEMENT - 30,000 SF**



# HDR

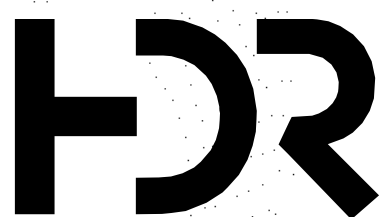
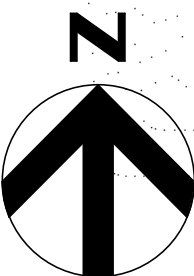


A-03

CONCEPT A -  
PHASE ONE /  
LEVEL TWO

1" = 50'-0"

PHASE ONE / LEVEL TWO  
FLEET MAINTENANCE - 6,240 SF



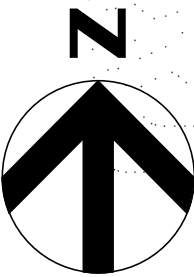


A-04

CONCEPT A -  
PHASE ONE /  
LEVEL THREE

1" = 50'-0"

PHASE ONE - LEVEL THREE
EMPLOYEE PARKING - 18,720 SF
RAMP - 5,900 SF





A-05

CONCEPT A -  
PHASE TWO /  
LEVEL ONE

1" = 50'-0"



EXISTING TO REMAIN	
BUS STORAGE -	24,445 SF
BUS OPERATIONS -	1,700 SF
BUS WASH BUILDING -	2,700 SF
FACILITIES MAINTENANCE -	3,970 SF

EXISTING TO BE RENOVATED	
FACILITIES MAINTENANCE -	2,710 SF

PHASE TWO / LEVEL ONE	
BUS OPERATIONS -	3,800 SF
BUS STORAGE -	26,364 SF
NEW PAVEMENT -	10,600 SF



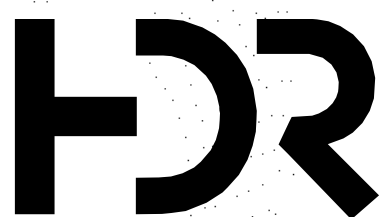


A-06

CONCEPT A -  
PHASE TWO /  
LEVEL TWO

1" = 50'-0"

PHASE TWO / LEVEL TWO  
BUS OPERATIONS - 10,800 SF



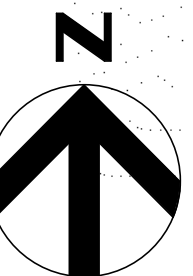


A-07

CONCEPT A -  
PHASE TWO /  
LEVEL THREE

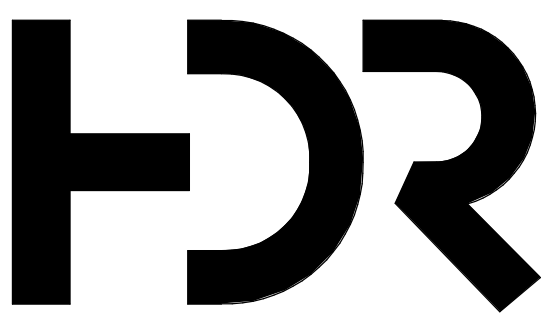
1" = 50'-0"

PHASE TWO / LEVEL THREE	
BUS OPERATIONS -	10,800 SF
EMPLOYEE PARKING -	19,344 SF





## 6.3 Concept B



MOUNTAIN LINE  
KASPAR  
HEADQUARTERS

BUS TURNING PATH

- OVERHANG PATH
- WHEEL PATH

D

C

B

A

D

C

B

A

modify exhibit

NEW PROPERTY LINE  
EXTENSION

EXISTING PROPERTY  
LINE

48'-0" +/-

DISTANCE FROM EDGE OF EXISTING PROPERTY  
LINE TO PROPOSED NEW EDGE OF RELOCATED  
RETAINING WALL AND PAVING

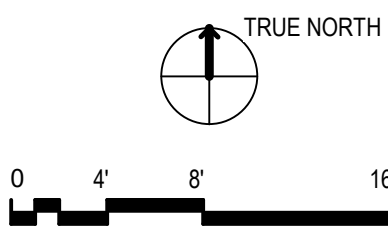
PROPOSED NEW  
CONCRETE PAVING =  
3,750 sf +/-

EXISTING SHOP 3 - ENCLOSED BUS STORAGE

EXISTING FUELING  
STATION

ENLARGED PLAN - CONCEPT A:  
PROPOSED LOT MODIFICATION FOR RELOCATED RETAINING WALL & EXPANDED PAVING

1" = 10'-0"







B-01

CONCEPT B

1" = 50'-0"





B-02

CONCEPT B -  
PHASE ONE /  
LEVEL ONE

1" = 50'-0"





B-03

CONCEPT B -  
PHASE TWO /  
LEVEL ONE

1" = 50'-0"





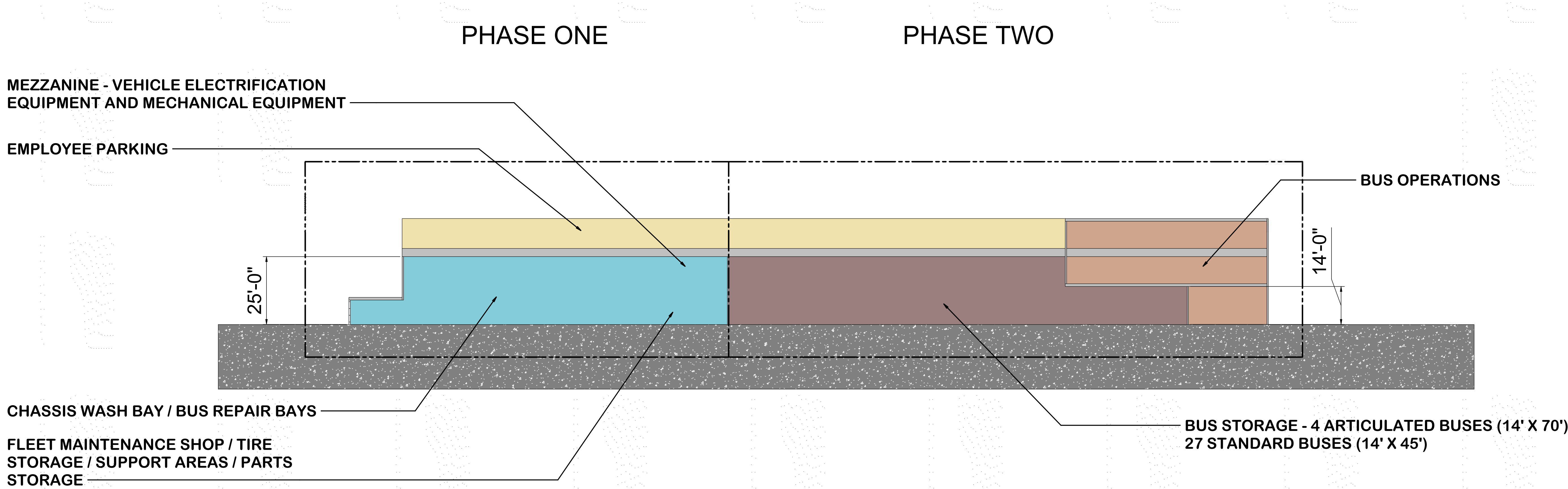
B-04

CONCEPT B -  
PHASE TWO /  
LEVEL TWO

1" = 50'-0"







B-05

CONCEPT B -  
SECTION  
DIAGRAM

1" = 20'-0"



## 6.4 Concept C





C-01

CONCEPT C

1" = 50'-0"





C-02

CONCEPT C -  
PHASE ONE /  
LEVEL ONE

1" = 50'-0"





C-03

CONCEPT C -  
PHASE TWO /  
LEVEL ONE

1" = 50'-0"

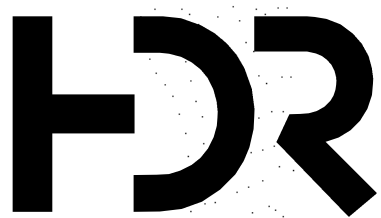




C-04

CONCEPT C -  
PHASE TWO /  
LEVEL TWO

1" = 50'-0"





## 7 Cost Estimates

### 7.1 Conceptual ROM for Concept A



### Concept A - Phase I

Summary of Project Costs by Level		Project GSF:	38,160	Resulting Cost/GSF
1. Level 1			\$9,737,000	\$255.00
2. Level 2			\$1,248,000	\$33.00
3. Level 3			\$3,516,000	\$92.00
<b>A. Construction Costs</b>			<b>\$14,501,000</b>	<b>\$380.00</b>
B. Escalation to 10/2023 (16%/Yr.)	24.12%		\$3,498,000	\$92.00
<b>C. Total Construction Cost w/ Escalation</b>			<b>\$17,999,000</b>	<b>\$472.00</b>

- Phase 1: Level 3 includes cost assumptions to finish the parking deck for vehicles (canopies, lighting, gates) and includes the ramp.
- Phase 1: Levels 1+2 include cost assumptions to build the 2-story shell of building with a parking-deck capable roof.

### Concept A - Phase II

Summary of Project Costs by Level		Project GSF:	56,214	Resulting Cost/GSF
1. Level 1			\$10,425,000	\$273.00
2. Level 2			\$4,050,000	\$106.00
3. Level 3			\$6,952,000	\$182.00
<b>A. Construction Costs</b>			<b>\$21,427,000</b>	<b>\$562.00</b>
B. Escalation to 4/2032 (5%/Yr.)	50.40%		\$10,799,000	\$283.00
<b>C. Total Construction Cost w/ Escalation</b>			<b>\$32,226,000</b>	<b>\$844.00</b>

**Excludes: Hard Rock Excavation, FF&E and Soft Costs**



## 8 Resilience Plans

### 8.1 Immediate Infrastructure Needs

Mountain Line has identified several functions that are required to maintain resilient operations during emergency events. Currently the following services are provided with standby power by means of a small engine generator to maintain operations in the event of a service disruption:

- Dispatch
- IT communications supporting dispatch

Primary dispatch services will move to the Downtown Connection Center however back-up dispatch functionality will remain at the Kaspar site. The existing generator is sufficient to serve the existing needs and will continue to be utilized in the near future.

### 8.2 Expanding Operational Resilience

In the future, standby power would like to be extended to:

- (2) additional 450 kW or 500 kW pantograph bus chargers
- All IT communications
- The bus diesel fueling system
- Site security including door hardware and cameras
- Critical heating systems may require standby power to prevent freezing.
- Critical cooling systems for equipment such as IT rooms
- Shop 1 Bay 2 for maintaining buses including receptacles, heating, and ventilation
- Shop 2 Bay 3 for maintaining buses including receptacles, heating, and ventilation

Expansion of standby power to these systems would allow for continuous operation in the event of an emergency causing a loss of service from Arizona Public Service. In order to accommodate growth in standby power needs for the Kaspar buildings, approximately 2 MW of total standby power is estimated to be needed upon realization of this plan.

### 8.3 Electric Service Consolidation

The current electrification project is installing a new service designed for the future bus chargers, to allow for consolidation of the existing electric services on site and to support the future construction of the new bus storage building. The new service includes space for future connection:

- Shop 3 400 A
- Photovoltaic arrays 200 A
- Future Admin 1000 A



- Future Building Generator 800 A (in addition to the 450-kW generator noted above)
- Spares (1) 800 A and (2) 200 A

## 8.4 Zero Emission Bus Transition

As the diesel buses are phased out for zero-emission electric buses, standby power will need to be provided to keep the buses charged in an emergency event. Under Mountain Line's current Zero-Emission Bus plan, the Downtown Connection Center will serve as the primary location for vehicle charging. The Downtown Connection Center is expected to grow to accommodate up to 13 bus chargers. The Kaspar site is anticipated to serve ancillary charging needs with up to (2) bus chargers. Standby power is required for bus charging at both the DCC and Kaspar site.

By 2028 or the electric bus fleet growing to 17 vehicles, one 450 kW pantograph bus charging is expected to be need standby power to support the electric vehicle bus fleet at the Kaspar site. (1) switchboard installed as part of the 2020 electrification project serving the (2) bus chargers may be intercepted in the future and:

4. Provided with permanent 450 kW engine generator through a manual transfer switch with an estimated 2020 cost of \$500,000.

OR

5. Provided with a docking station for a 450-kW temporary generator connection with an estimated 2020 cost of \$50,000 plus the rental, lease, or purchase cost of the temporary generator. The docking station would allow for a safe point of connection for a temporary generator, whether rented, leased, or owned by Mountain Line.

By 2023 or the electric bus fleet growing to 28 vehicles, up to an additional 1500 kW of power demands are anticipated at the Kaspar site to support additional charging and maintenance needs. There currently is not enough space on-site to locate a 1500 kW generator with the required maintenance and safety clearances and therefore the generator is preferred to be located in the mezzanine of the future fleet maintenance building. Approximately 1,000 SF of space is anticipated for the engine generator. The 2020 cost of a 1500 kW generator is estimated at \$1.5 million.

Locating the 1500 kW engine generator in the future fleet maintenance building is the preferred solution as it would not displace employee parking or disrupt the existing retaining wall and forest north of the bus storage building. If additional standby power is required at the Kaspar site prior to the renovation of the administration building, the docking station and temporary generator is the preferred solution.

Resilience needs at the Downtown Connection Center site are anticipated to be addressed during the design of the bus charging stations. Current resilience options to be considered at DCC include:

1. Utilizing APS's downtown smart grid
2. Bringing redundant APS feeds to the DCC site
3. On-site standby power (such as an engine generator)



## 8.5 Alternative Means of Standby Power

Alternative options for standby power were investigated as part of the Kaspar site planning process. Alternative standby power options include:

- APS owned and operated microgrid potentially including
  - Ultra-capacitors ('power burst batteries')
  - Tier 4 diesel generator
  - Battery energy storage systems
- Mountain Line battery energy storage systems

On-site battery energy storage systems require more space than conventional standby engine generators and therefore would not be feasible due to space constraints at the Kaspar facility. Common, commercially available battery energy storage systems commonly require three to four times the space of an equivalently sized engine generator.

## 8.6 APS Micro-Grid

An APS owned and operated micro-grid may be a feasible option pending final analysis and validation from APS. On-site at the Kaspar site is limited however the drive island north of the bus wash is the largest location available to locate an APS microgrid. The microgrid is expected to require approximately the area of a semi-trailer. Alternatively, an APS microgrid could be located off-site. The APS microgrid would be controlled by APS and limit Mountain Line's control over power needs during an emergency and during non-emergency events where standby power may be beneficial such as electrical changeovers during construction.

The estimated 2020 cost for APS to building 2 MW of standby power for the Kaspar site is approximately \$3 million (pending final APS review). A total 2 MW of Mountain Line owned engine generators for standby power is estimated to cost about \$2 million in additional to annual maintenance costs averaging \$40,000/year. The approximately value of each option is similar however APS may be able to share the cost of their micro-grid solution resulting in a payback over time or an immediate cost savings to Mountain Line.



## 8.7 Standby Power Locations





Figure 1: Standby power locations



## 8.8 Resilience Plan Matrix



Resilience Needs - Kaspar HQ							
Systems	Need Description	Amount Power	Duration	2023	2028	2033	2043
<b>Communication: internet, phone, bus data</b>	Need network power for internet and phones: main IT room and Shop 3 IT room;	IT rooms and cooling	Until refueling of standby power can occur (est 24 hours)	<b>Immediate - served by existing generator</b>	<b>Tie to new 450 kW engine generator at Kaspar</b>		
<b>Bus Diesel Fueling</b>	Backup plan for diesel fueling is currently to fuel offsite (Carter Oil); plan for enabling fueling with power outage;	Pumps, controls, communications	If more than 18-24 hour outage; need fueling backup (currently fuel offsite)				
<b>Dispatch</b>	DCC will be main dispatch - Kaspar will be backup; need Kaspar Dispatch to run with one workstation and radios	Receptacles in Dispatch	Until refueling of standby power can occur (est 24 hours)	<b>Immediate DCC served by new building generator Kaspar served by existing generator</b>			
<b>EV Bus Charging</b>	Full Buildout: (2) 450 kW chargers at Kaspar + (8) 450 kW chargers at DCC;	Peak Grid Demand @ Full Buildout: 900 kW at Kaspar + 5850 kW at DCC	DCC charging: 16 hours per weekday, 13 hours per weekend day Kaspar charging: top-off at end of service, 8pm-12am	<b>No standby power for electric buses required due to current size of diesel fleet</b>  2 battery electric buses in service (1) 450 kW charger in operation at Kaspar	<b>Resilience provisions at DCC Phase 2</b>  15 more battery electric buses in service (total 17), appr. 8/9 routes electrified (1) additional 450 kW charger at Kaspar (8) 450 kW chargers at DCC	<b>Add 1500 kW standby power at Kaspar</b>  11 more battery electric buses in service (total 28), all routes electrified No additional chargers added	<b>No new standby power</b> Anticipating service growth: 7 more battery electric buses in service (total 35), all routes electrified (2) 450 kW chargers at Kaspar (13) 450 kW chargers added at DCC
<b>Ops Emergency Staffing</b>	Kaspar master plan programming called for overnight emergency sleep area (dual purpose wellness room) power in this room(s)	Receptacle and lighting	Until refueling of standby power can occur (est 24 hours)			<b>Tie to standby power at Kaspar</b>	
<b>Fleet Maintenance</b>	Keep one -bay powered	Lighting, heat, and power	If more than 24 hours - need power in one bay				
<b>Facilities HVAC</b>	No HVAC backup for offices/with downsizing IT room at Kaspar, provide adequate HVAC backup to prevent pipe freezing	Freeze protection heating	Until refueling of standby power can occur (est 24 hours)				
<b>Facilities: site (gates, lighting)</b>		Site lighting & gates	Gates probably work 24-48 hours if used/ could lock open if needed No backup needed				
<b>Facilities: Door FOB access</b>		Security circuits	Less than 24 hours outage-door access works If running backup power to IT systems, include Door access (minimal power needed)				
<b>Facilities: Security Cameras</b>	seeking power backup for camera system	Security circuits	Until refueling of standby power can occur (est 24 hours)				





## Appendices





## Appendix A

### Space Needs Program



KASPAR HEADQUARTERS MASTER PLAN

FLAGSTAFF, AZ 86001

SPACE NEEDS PROGRAM

Space Needs Program 10/28/2022				EXISTING FACILITY			Space Standards	2028 PROGRAM			2033 PROGRAM			2043 PROGRAM			Remarks
Qty.			Area (SF)	Qty.		Area (SF)		Qty.		Area (SF)	Qty.		Area (SF)				
Staff	Space			Staff	Space			Staff	Space		Staff	Space		Staff	Space		
SHOP 0 - BUS OPERATIONS																	
Office Areas																	
ADMINISTRATION																	
ACCOUNTING TECHNICIAN II				1	0.5	90	10	x	18	0	0	0	0	0	0	0	MOVES TO DCC
CEO & GENERAL MANAGER				1	1	160	16	x	10	0	0	0	0	0	0	0	MOVES TO DCC
EXECUTIVE ASSISTANT / CLERK OF BORAD				1	1	100	10	x	10	0	0	0	0	0	0	0	MOVES TO DCC
DEPUTY GENERAL MANAGER				1	1	150	10	x	15	0	0	0	0	0	0	0	MOVES TO DCC
ELIGIBILITY SPECIALIST				1	1	96	8	x	12	0	0	0	0	0	0	0	MOVES TO DCC
HUMAN RESOURCES INTERN (STUDENT)				0.5	1	180	10	x	18	0	0	0	0	0	0	0	MOVES TO DCC
HUMAN RESOURCES MANAGER				1	1	180	10	x	18	0	0	0	0	0	0	0	MOVES TO DCC
HUMAN RESOURCES SPECIALIST				1	1	96	8	x	12	0	0	0	0	0	0	0	MOVES TO DCC
HUMAN RESOURCES TECHNICIAN-PT				0.5		0		x		0	0	0	0	0	0	0	MOVES TO DCC / MISSING FROM SEATING CHART
MANAGEMENT SERVICES DIRECTOR				1	1	180	10	x	18	0	0	0	0	0	0	0	MOVES TO DCC
MARKETING AND COMMUNICATIONS MANAGER				1	1	150	10	x	15	0	0	0	0	0	0	0	MOVES TO DCC
SAFETY MANAGER				1	1	144	12	x	12	0	0	0	0	0	0	0	MOVES TO DCC
CAPITAL PROJECT MANAGER				1	1	120	8	x	15	0	0	0	0	0	0	0	MOVES TO DCC / MOBILITY SPECIALIST OFFICE
ASSOCIATE TRANSIT PLANNER				1	0.25	72	24	x	12	0	0	0	0	0	0	0	MOVES TO DCC
MOBILITY PLANNER				1	1	120	8	x	15	0	0	0	0	0	0	0	MOVES TO DCC
PLANNING INTERN (STUDENT)				0.25	0.25	72	24	x	12	0	0	0	0	0	0	0	MOVES TO DCC
PLANNING INTERN (MONTOKA FELLOWSHIP)				0.5	0.25	72	24	x	12	0	0	0	0	0	0	0	MOVES TO DCC
PURCHASING AND CONTRACTS OFFICER				1		0		x		0	0	0	0	0	0	0	MOVES TO DCC / MISSING FROM SEATING CHART
FINANCIAL ANALYST				1	0.5	90	10	x	18	0	0	0	0	0	0	0	MOVES TO DCC
TRANSIT PLANNER				1	1	96	8	x	12	0	0	0	0	0	0	0	MOVES TO DCC
BUS OPERATIONS																	
OPERATIONS COORDINATOR				1	1	144	12	x	12	2	2	288	2	2	432	3	PRIVATE OFFICE 1
OPERATIONS DIRECTOR				1	1	150	10	x	15	0	0	0	0	0	0	0	MOVES TO DCC
OPERATIONS MANAGER				1	1	120	10	x	12	1	1	120	1	1	120	1	PRIVATE OFFICE 2
OPERATIONS SUPERVISOR				8	1	100	10	x	10	9	0	0	11	0	0	12	TWO SUPERVISOR PER SHIFT AT KASPAR / 2 SUPERVISORS AT DCC
PARATRANSIT OPERATIONS COORDINATOR				1		0		x		0	0	0	0	0	0	0	NOT NEEDED / missing from seating chart
TRANSIT OPERATOR				53	0	0	0	x	0	63	63	0	76	0	0	100	HANG OUT IN OPERATORS ROOM
TRAINER				2	1	252	14	x	18	2	1	252	2	1	252	2	SHARED OFFICE 2
FLEET MAINTENANCE																	
BUS DETAILER / FUELER				2.5	0	0	0	x	0	0	0	0	0	0	0	0	MOVES TO FLEET MAINTENANCE BUILDING
FLEET SUPERVISOR				1	1	144	12	x	12	0	0	0	0	0	0	0	MOVES TO FLEET MAINTENANCE BUILDING
MAINTENANCE MANAGER				1	1	120	10	x	12	0	0	0	0	0	0	0	MOVES TO FLEET MAINTENANCE BUILDING
MECHANIC				4	1	144	12	x	12	0	0	0	0	0	0	0	MOVES TO FLEET MAINTENANCE BUILDING
FACILITIES MAINTENANCE																	
FACILITIES OFFICE				4	1	180	12	x	15	0	0	0	0	0	0	0	SHARED / FLEX OFFICE SPACE FOR FACILITIES TEAM / SHARED OFFICE 3
FACILITIES COORDINATOR				1						1	0	0	1	0	0	1	MOVES TO FACILITIES MAINTENANCE BUILDING
FACILITIES TECHNICIAN I				0						1	0	0	2	0	0	4	MOVES TO FACILITIES MAINTENANCE BUILDING
FACILITIES TECHNICIAN II				2						2	0	0	3	0	0	3	MOVES TO FACILITIES MAINTENANCE BUILDING
FACILITIES TECHNICIAN III				1						1	0	0	2	0	0	2	MOVES TO FACILITIES MAINTENANCE BUILDING



KASPAR HEADQUARTERS MASTER PLAN

FLAGSTAFF, AZ 86001

SPACE NEEDS PROGRAM

Space Needs Program 10/28/2022	EXISTING FACILITY			Space Standards	2028 PROGRAM			2033 PROGRAM			2043 PROGRAM			Remarks
	Qty.		Area (SF)		Qty.		Area (SF)	Qty.		Area (SF)	Qty.		Area (SF)	
	Staff	Space			Staff	Space		Staff	Space		Staff	Space		
INFORMATION TECHNOLOGY														
DOCUMENT CONTROL SPECIALIST - PT	0.5	1	140	10 x 14	0	0	0	0	0	0	0	0	MOVES TO DCC	
INFORMATION TECHNOLOGY INTERN (STUDENT)	0.5	0	0	14 x 16	0	0	0	0	0	0	0	0	MOVES TO DCC	
INFORMATION TECHNOLOGY MANAGER	1	1	140	10 x 14	0	0	0	0	0	0	0	0	MOVES TO DCC	
INFORMATION TECHNOLOGY SPECIALIST	1	0.5	112	14 x 16	0	0	0	0	0	0	0	0	MOVES TO DCC	
INFORMATION TECHNOLOGY TECHNICIAN	1	0.5	112	14 x 16	0	0	0	0	0	0	0	0	MOVES TO DCC	
Subtotal Office Areas	101.25		4026		82		660	100		660	128		804	
Office Support Areas														
IT FLEX WORKSTATIONS				10 X 12	2		240	2		240	2		240	
CONFERENCE / MEETING ROOM		1	150	25 SF / PERSON		2	300		2	300		3	450	HOW MANY PEOPLE IN A MEETING SPACE AT ONCE?
PRINTER / COPY / STORAGE AREA		1	100	100		0.5	50		0.5	50		0.5	50	SMALLER THAN EXISTING
MENS RESTROOM 1		1	500	500		1	500		1	500		1	500	
WOMENS RESTROOM 1		1	500	500		1	500		1	500		1	500	
GENDER NUETRAL RESTROOM		2	300	150		1	150		1	150		1	150	THESE ARE CURRENTLY NOT NEEDED PUBLIC MENS AND WOMENS RESTROOM
LOCKER ALCOVE		53	0	2.5 x 2	63	31.5	157.5	76	38	190	100	50	250	PROVIDE LOCKERS FOR 1/2 OF OPERATORS
DRIVER'S LOUNGE / WELLNESS		1	550			1	900		1	900		1	1100	DOUBLE CURRENT SIZE INCLUDING KITCHENETTE
DISPATCH		1	250			1	250		1	250		1	250	I DISPATCH FOR PARATRANSIT AND FITNESS FOR DUTY
OPERATIONS SUPERVISORS FLEX DISPATCH WORKSTATIONS		0	0	10 X 12		2	240		2	240		2	240	
MAIL ROOM		1	160	160		0.5	80		0.5	80		0.5	80	NEED SMALL SPACE FOR LOCKABLE STORAGE
LOBBY		1	190	190		0	0		0	0		0	0	NOT NEEDED AT KASPAR - MOVE TO DCC
MENS RESTROOM 2		1	75	75		0	0		0	0		0	0	
WOMENS RESTROOM 2		1	75	75		0	0		0	0		0	0	
IT CONFERENCE / TRAINING ROOM		1	500	500		0	0		0	0		0	0	NO NEED FOR A CONFERENCE ROOM - IT MOVES TO DCC
SERVER ROOM		1	180	180		1	180		1	180		1	180	CONTINUE USE OF EXISTING SERVER ROOM
DRIVER'S TRAINING ROOM		0	0	25 SF / PERSON		1	1500		1	1500		1	2000	HOLDS APPROXIMATELY 80 PEOPLE
UNIFORM STORAGE		0	0	150		1.5	225		1.5	225		1.5	225	MOVES HERE FROM SHOP 3
QUIET ROOM		0	0			1	200		1	200		1	200	FOR QUIET REST BETWEEN SHIFTS OR IN CASE OF EMERGENCY
WELLNESS / EXCERSIZE ROOM		0	0			1	350		1	350		1	350	SMALL SPACE FOR EXCERSIZE / SPACE FOR THIS IN DESIGN AT DCC
BUS SIMULATOR TRAINING ROOM		0	0	400		1	400		1	400		1	400	
Office Support Areas Subtotal			2700				6223			6255			7165	



Space Needs Program					EXISTING FACILITY			Space Standards	2028 PROGRAM			2033 PROGRAM			2043 PROGRAM			Remarks	
10/28/2022					Qty.		Area (SF)		Qty.		Area (SF)	Qty.		Area (SF)	Qty.		Area (SF)		
					Staff	Space			Staff	Space		Staff	Space		Staff	Space			
SHOP AREAS																			
PARTS CORRAL							1	1000				0	0			0	0	MOVES TO FLEET MAINTENANCE BUILDING	
TIRE STORAGE							1	1200				0	0			0	0	MOVES TO FLEET MAINTENANCE BUILDING	
OIL ROOM							1	200				0	0			0	0	MOVES TO FLEET MAINTENANCE BUILDING	
Shop Areas Subtotal								1980				0	0			0	0		
STORAGE AREAS																			
ENCLOSED BUS STORAGE							1	5500			5500		0	0		0	0	MOVES TO NEW ENCLOSED BUS STORAGE LOCATION	
IT STORAGE ROOM							1	130			130		1.25	162.5		1.25	162.5		
JANITOR CLOSET 1							1	75			75		1	75		1	75		
MECHANICAL ROOM 1							1	100			100		1	100		1	100		
STORAGE ROOM							1	100			100		1	100		1	100		
MECHANICAL ROOM 2							1	100			100		1	100		1	100		
JANITOR CLOSET 2							1	25			25		1	25		1	25		
Shop Areas Subtotal								6120						562.5			562.5		
SUBTOTAL SHOP 0 - BUS OPERATIONS							101.25			14826		82		7445		100		7477.5	
Circ/Mech/Elec/Struc (Net: Gross)																			
Circulation/Struct								4548			25%			0			1869	2141	
Electrical Room											0.02 bldg sf			0			150	171	
Data/Comm Room											0.005 bldg sf			0			37	43	
Fire/Sprinkler Room											0.005 bldg sf			0			37	43	
TOTAL SHOP 0 - BUS OPERATIONS							101			19374		82		7445		100		9571	10962



KASPAR HEADQUARTERS MASTER PLAN

FLAGSTAFF, AZ 86001

SPACE NEEDS PROGRAM

Space Needs Program 10/28/2022				EXISTING FACILITY			Space Standards	2028 PROGRAM			2033 PROGRAM			2043 PROGRAM			Remarks
Qty.			Area (SF)	Qty.		Area (SF)		Qty.		Area (SF)	Qty.		Area (SF)				
Staff	Space			Staff	Space			Staff	Space		Staff	Space					
SHOP 1 - FLEET MAINTENANCE																	
Office Areas																	
BUS DETAILER / FUELER		0	0	0	0	x	0	2	0	0	1	0	0	1	0	0	
FLEET SUPERVISOR		0	0	0	0	x	12	1	1.5	216	2	1.5	216	2	2	288	
MAINTENANCE MANAGER		0	0	0	0	x	10	1	1	120	1	1	120	1	1	120	
MECHANIC		0	0	0	0	x	12	5	1.5	216	7	1.5	216	9	2	288	
Subtotal Office Areas		0		0				9		552	11		552	13		696	
Office Support Areas																	
MENS RESTROOM / LOCKERS / SHOWER			0	0			450		1	450		1	450		1	450	
WOMENS RESTROOM / LOCKERS / SHOWER			0	0			180		1	180		1	180		1	180	
LAUNDRY ROOM			0	0			200		1	200		1	200		1	200	
Office Support Areas Subtotal				0						830			830			830	
Shop Areas																	
PARTS CORRAL			0	0			1000		1.25	1250		1.25	1250		1.5	1500	
TIRE STORAGE			0	0			1200		1.25	1500		1.25	1500		1.5	1800	
LUBE / COMPRESSOR ROOM			0	0			600		1	600		1	600		1	600	
STANDARD REPAIR BAY (45' BUS)			2	2400		20	x 60		2	2400		2	2400		3	3600	
ARTICULATED REPAIR BAY (65' BUS)			0	0		20	x 80		1	1600		1	1600		2	3200	
COMMON WORK AREA			1	100					1	300		1	300		1	400	
TOOL BOXES			1	75					1	75		1	75		1	200	
TIRE SHOP			1	135					1	400		1	400		1	400	
PORTABLE EQUIPMENT STORAGE			0	0		200			1	200		1	200		2	400	
ELECTRONICS SHOP			0	0					1	300		1	300		1	300	
WELDING AREA			0	0					1	400		1	400		1	400	
REBUILD AREA			0	0					1	400		1	400		1	400	
CHASSIS WASH BAY			0	0		25	x 80		1	2000		1	2000		1	2000	
WASH EQUIPMENT ROOM			0	0		10	x 10		1	100		1	100		1	100	
BATTERY SHOP			0	0					1	300		1	300		1	300	
Shop Areas Subtotal				2710						11825			11825			15600	
SUBTOTAL SHOP 1 - FLEET MAINTENANCE																	
Circ/Mech/Elec/Struc (Net: Gross)																	
Circulation/Struct						25%				3302			3302			4282	
Electrical Room						0.025 bldg sf				330			330			428	
Data/Comm Room						0.005 bldg sf				66			66			86	
Fire/Sprinkler Room						0.02 bldg sf				264			264			343	
TOTAL SHOP 1 - FLEET MAINTENANCE																	
		0		2710				9		17169	11		17169	13		22264	



KASPAR HEADQUARTERS MASTER PLAN

FLAGSTAFF, AZ 86001

SPACE NEEDS PROGRAM

Space Needs Program 10/28/2022				EXISTING		FACILITY		Space Standards		2028		PROGRAM		2033		PROGRAM		2043		PROGRAM		Remarks				
		Qty.		Area (SF)	Qty.		Area (SF)			Qty.		Area (SF)	Qty.		Area (SF)	Qty.		Area (SF)	Qty.		Area (SF)					
		Staff	Space							Staff	Space		Staff	Space		Staff	Space									
SHOP 2 - FACILITIES MAINTENANCE																										
Office Areas																										
FACILITIES OFFICE			0	0		0		12	x	15		5	1.5		270		8	2		360		10	3		540	SHARED / FLEX OFFICE SPACE FOR FACILITIES TEAM / SHARED OFFICE 3
FACILITIES COORDINATOR			0					0	x	0		1	0.25				1	0.25				1	0.25			
FACILITIES TECHNICIAN I			0					12	x	12		1	0.5				2	0.5				4	1			
FACILITIES TECHNICIAN II			0					10	x	12		2	0.75				3	0.75				3	0.75			
FACILITIES TECHNICIAN III			0					12	x	12		1	0.5				2	0.5				2	0.75			
Subtotal Office Areas			0				0					5			270		8			360		10			540	
Shop Areas																										
FACILITIES SUPPLY STORAGE					1		370			400			1.25		400			1.25		500			1.5		600	MOSTLY USED FOR EQUIPMENT STORAGE (NON REVENUE FLEET)
FACILITIES MAINTENANCE SHOP					1		1000			1000			1.25		1000			1.25		1250			1.5		1500	
PORTABLE EQUIPMENT STORAGE					1		150			200			1.25		200			1.25		250			1.5		300	
WELDING AREA					1		150			200			1		200			1		200			1		200	
GENDER NEUTRAL RESTROOM					2		300			150			2		150			2		300			2		300	
Subtotal Shop Areas			0				1970					0			1950		0			2500		0			2900	
Enclosed Vehicle Storage																										
ENCLOSED BUS STORAGE					1		2000			2000			0		0			0		0			0		0	MOVES TO NEW ENCLOSED BUS STORAGE
Subtotal Shop Areas			0				2000					0			0		0			0		0			0	
Non-Revenue Fleet																										
2000 YALE FORKLIFT					1					8 x 10			1		80			1		80			1		80	SMALL
2003 CHEVY 3/4 TON TRUCK					1					10 x 25			1		250			1		250			1		250	MEDIUM
2006 CONTRAIL TRAILER					1					12 x 35			1		420			1		420			1		420	LARGE
2006 BOBCAT TOOL CAT					1					8 x 10			1		80			1		80			1		80	SMALL
2008 FORD 4WD ESCAPE					1					10 x 25			1		250			1		250			1		250	MEDIUM
2008 FORD 1 TON 4X4 SERVICE TRUCK					1					10 x 25			1		250			1		250			1		250	MEDIUM
2008 CHEVY UPLANDER W LIFT					1					10 x 25			1		250			1		250			1		250	MEDIUM
2012 FORD 1 TON 4X4 SERVICE TRUCK					1					10 x 25			1		250			1		250			1		250	MEDIUM
2014 MOBILITY VENTURE					1					10 x 25			1		250			1		250			1		250	MEDIUM
2015 MOBILITY VENTURE					1					10 x 25			1		250			1		250			1		250	MEDIUM
2015 BOBCAT TOOL CAT					1					8 x 10			1		80			1		80			1		80	SMALL
2016 FORD F450					1					10 x 25			1		250			1		250			1		250	MEDIUM
NEW F350					0					10 x 25			0		0			1		250			2		500	MEDIUM
NEW FRONT END LOADER					0					10 x 25			0		0			1		250			1		250	MEDIUM
Non-Revenue Fleet Subtotal					12								12		2660			14		3160			15		3410	
SUBTOTAL SHOP 2 - FACILITIES MAINTENANCE			0		12		3970					5	12		4880		8	14		6020		10	15		6850	
Circ/Mech/Elec/Struc (Net: Gross)																										
Circulation/Struct										15%					732					903					1028	
Electrical Room										0.025 bldg sf					122					151					171	
Data/Comm Room										0.005 bldg sf					24					30					34	
Fire/Sprinkler Room										0.005 bldg sf					24					30					34	
TOTAL SHOP 2 - FACILITIES MAINTENANCE			0		12		3970					5	12		5783		8	14		7134		10	15		8117	



Space Needs Program 10/28/2022				EXISTING FACILITY			Space Standards	2028 PROGRAM			2033 PROGRAM			2043 PROGRAM			Remarks	
Qty.			Area (SF)	Qty.		Area (SF)		Qty.		Area (SF)	Qty.		Area (SF)					
Staff	Space			Staff	Space			Staff	Space		Staff	Space						
SHOP 3 - ENCLOSED BUS STORAGE																		
Building Support Areas																		
MEETING ROOM					1	1000	1000		1	1000		1	1000		1	1000		
UNIFORM STORAGE					1	150	150		1	150		1	150		1	150	MOVES TO BUS OPERATIONS BUILDING	
ALCOVE					1	200	200		1	200		1	200		1	200		
MEN'S BATHROOM					1	150	150		1	150		1	150		1	150		
WOMEN'S BATHROOM					1	150	150		1	150		1	150		1	150		
JANITOR'S CLOSET					1	50	50		1	50		1	50		1	50		
BOILER ROOM					1	450	450		1	450		1	450		1	450		
HANDICAP BATHROOM					1	50	50		1	50		1	50		1	50		
FLUID STORAGE					1	70	70		1	70		1	70		1	70		
COMPRESSOR ROOM					1	75	75		1	75		1	75		1	75		
COMMUNICATIONS ROOM					1	100	100		1	100		1	100		1	100		
ELECTRICAL MEZZANINE					0	0			1	3000			1	3000		1	3000	EMERGENCY GENERATOR AND BEB CHARGING EQUIPMENT LOCATED HERE
Building Support Areas Subtotal						2445				5445				5445				
Existing Bus Storage Areas																	29 STANDARD BUSES 3 ARTICULATED	
ACTIVE REVENUE FLEET					1	22000	22000											
CHAMPION LOW FLOOR					2		14 x 35		0	0		0	0		0	0	BASED ON ABOUT 33% GROWTH IN THE NUMBER OF BUSES	
2010 CHEVY ARBOC EXPRESS 3500 W RAMP					1		14 x 35		0	0		0	0		0	0	FROM SHOP 0	
2013 FORD E-450 ELDORADO AEROTECH W LIFT					5		14 x 35		2	980		0	0		0	0	FROM SHOP 0	
2015 FORD E-450 STARCRAFT W LIFT					2		14 x 35		2	980		0	0		0	0	FROM SHOP 0	
2014 NEW FLYER 60' HYBRID					1		14 x 70		1	980		1	980		0	0		
2017 NEW FLYER 60' HYBRID					5		14 x 70		3	2940		2	1960		0	0		
2007 GILLIG 35' HYBRID					2		14 x 45		0	0		0	0		0	0		
2009 GILLIG 35' HYBRID					1		14 x 45		0	0		0	0		0	0		
2011 GILLIG 35' HYBRID					7		14 x 45		2	1260		0	0		0	0		
2012 GILLIG 35' HYBRID					1		14 x 45		1	630		1	630		0	0		
2013 GILLIG 35' HYBRID					6		14 x 45		3	1890		2	1260		0	0		
2014 GILLIG 35' HYBRID					2		14 x 45		2	1260		1	630		0	0		
2015 GILLIG 35' HYBRID					2		14 x 45		2	1260		1	630		0	0		
2016 GILLIG 35' HYBRID					2		14 x 45		2	1260		1	630		0	0		
NEW PARATRANSIT ELECTRIC					0		14 x 35		4	1960		9	4410		16	7840		
NEW 40' ELECTRIC					0		14 x 45		14	8820		26	16380		42	26460		
NEW 60' ELECTRIC					0		14 x 70		2	1960		6	5880		10	9800		
Active Revenue Fleet Subtotal					39	22000			40	26180		50	33390		68	44100		
SUBTOTAL SHOP 3 - ENCLOSED BUS STORAGE						24445			40	31625		50	38835		68	49545		
Circ/Mech/Elec/Struc (Net: Gross)																		
Circulation/Struct							15%			4744			5825			7432		
Electrical Room							0.025 bldg sf			791			971			1239		
Data/Comm Room							0.005 bldg sf			158			194			248		
Fire/Sprinkler Room							0.005 bldg sf			158			194			248		
TOTAL SHOP 3 - ENCLOSED BUS STORAGE						24445			40	37476		50	46019		68	58711		



Space Needs Program 10/28/2022				EXISTING FACILITY			Space Standards	2028 PROGRAM			2033 PROGRAM			2043 PROGRAM			Remarks
Qty.		Area (SF)		Qty.		Area (SF)		Qty.		Area (SF)	Qty.		Area (SF)				
Staff	Space			Staff	Space			Staff	Space		Staff	Space					
BUSH WASH BUILDING																	
Building Areas																	
BUS WASH					1	1900			1	1900		1	1900		1	1900	
EQUIPMENT ROOM					1	800			1	800		1	800		1	800	
Subtotal Building Areas						2700				2700			2700			2700	
SUBTOTAL BUSH WASH BUILDING						2700				2700			2700			2700	
Circ/Mech/Elec/Struc (Net: Gross)																	
Circulation/Struct							15%			0							
TOTAL BUSH WASH BUILDING				0		2700		0.0		2700	0.0		2700	0.0		2700	
EXTERIOR NON-REV VEHICLE PARKING																	
Non-Rev Vehicle																	
2001 FORD GOSHEN VAN W LIFT					1	350	10 x 35		1	350		1	350		0	0	
2006 FORD ELDORADO VAN W LIFT					1	350	10 x 35		1	350		1	350		0	0	
2007 FORD E-450 ELDORADO AEROTECH W LIFT					2	700	10 x 35		2	700		2	700		0	0	
2007 FORD E-450 ELDORADO AEROLITE W LIFT					1	350	10 x 35		1	350		1	350		0	0	
Shuttle Vehicle (EV)					0	0	10 x 35		0	0		0	0		5	1750	
Subtotal Non-Rev Vehicle					5	1750			5	1750		5	1750		5	1750	
SUBTOTAL EXTERIOR VEHICLE PARKING					5	1750			5	1750		5	1750		5	1750	
Circulation (Net: Gross)																	
Circulation							100%			0			1750			1750	
TOTAL EXTERIOR VEHICLE PARKING					5	1750			5	1750		5	3500		5	3500	
DOWN LINE / READY LINE																	
Down Line / Ready Line																	
Down Line/Ready Line - Standard Bus					0	0	12 x 45		0	0		1	540		2	1080	
Down Line/Ready Line - Articulated Bus					0	0	12 x 65		0	0		1	780		2	1560	
Subtotal Down Line / Ready Line					0	0			0	0		2	1320		4	2640	
SUBTOTAL DOWN LINE / READY LINE					0	0			0	0		2	1320		4	2640	
Circulation (Net: Gross)																	
Circulation						0	100%			0			1320			2640	
TOTAL DOWN LINE / READY LINE						0			0	0		2	2640		4	5280	



Space Needs Program 10/28/2022	EXISTING		FACILITY	Space Standards	2028		PROGRAM	2033		PROGRAM	2043		PROGRAM	Remarks
	Qty.		Area (SF)		Qty.		Area (SF)	Qty.		Area (SF)	Qty.		Area (SF)	
	Staff	Space			Staff	Space		Staff	Space		Staff	Space		
EMPLOYEE/VISITOR PARKING														
Employee Parking														
Employee / Visitor Parking														
Subtotal Employee Parking														
Miscellaneous Parking														
Accessible Parking														
Clean Air / Electric Vehicle Parking														
Subtotal Miscellaneous Parking														
SUBTOTAL EMPLOYEE/VISITOR PARKING														
Circ/Struc (Net: Gross)														
Circulation														
TOTAL EMPLOYEE/VISITOR PARKING														
MISCELLANEOUS EXTERIOR AREAS														
Exterior Areas														
FUEL ISLAND														
COVERED WALKWAY														
SNOW PLOW EQUIPMENT / OUTSIDE STORAGE														
TRASH AREA														
FUEL TANKS														
STORAGE BINS														
BUS CHARGING STATION														
Subtotal Miscellaneous Parking														
SUBTOTAL EMPLOYEE/VISITOR PARKING														
Circ/Struc (Net: Gross)														
Circulation														
TOTAL EMPLOYEE/VISITOR PARKING														





## Appendix B

### Mountain Line Vehicle List





Name	Description	Purchased Date	In Service Date	Useful Life (Months)	Remaining Useful Life (Months)	Useful Life (Odometer)	Remaining Useful Life (Odometer)	Condition Assessment	Cost Per unit (Life)	Mid-Life Date	Battery Refresh Kit
5356	2017 New Flyer 60' Hybrid	7/5/2017	8/1/2017	180	126	500000	386659	Excellent	0.166		
5357	2017 New Flyer 60' Hybrid	6/30/2017	8/1/2017	180	126	500000	386560	Excellent	0.132	6/18/2020	
5358	2017 New Flyer 60' Hybrid	6/30/2017	8/1/2017	180	126	500000	386224	Excellent	0.156	5/24/2021	
5359	2017 New Flyer 60' Hybrid	7/6/2017	8/1/2017	180	126	500000	381376	Excellent	0.296	2/19/2021	
5360	2017 New Flyer 60' Hybrid	7/6/2017	8/1/2017	180	126	500000	385730	Excellent	0.162		
5361	2016 Gillig 35' Hybrid	6/29/2016	11/15/2016	180	114	500000	320817	Excellent	0.135		
5362	2016 Gillig 35' Hybrid	6/16/2016	11/15/2016	180	114	500000	318882	Excellent	0.1		
5363	2015 Gillig 35' Hybrid	6/5/2015	7/29/2015	180	102	500000	265918	Excellent	0.186		
5364	2015 Gillig 35' Hybrid	6/5/2015	7/29/2015	180	103	500000	276547	Good	0.188		
5365	2014 New Flyer 60' Hybrid	4/16/2014	8/18/2014	180	90	500000	325477	Excellent	0.297		
5366	2014 Gillig 35' Hybrid	4/16/2014	6/25/2014	180	88	500000	243546	Excellent	0.187		
5367	2014 Gillig 35' Hybrid	4/16/2014	6/2/2014	180	88	500000	227956	Excellent	0.157		
5368	2013 Gillig 35' Hybrid	2/15/2013	3/13/2013	180	75	500000	157002	Excellent	0.131		
5369	2013 Gillig 35' Hybrid	2/15/2013	3/13/2013	180	75	500000	127803	Excellent	0.123		11/19/2021
5370	2013 Gillig 35' Hybrid	2/15/2013	3/13/2013	180	75	500000	149732	Excellent	0.235	6/1/2017	11/19/2021
5371	2013 Gillig 35' Hybrid	2/15/2013	3/13/2013	180	75	500000	176515	Excellent	0.159		
5372	2013 Gillig 35' Hybrid	2/15/2013	3/13/2013	180	75	500000	123081	Excellent	0.146		11/19/2021
5373	2013 Gillig 35' Hybrid	2/15/2013	3/13/2013	180	75	500000	128154	Excellent	0.142		
5376	2012 Gillig 35' Hybrid	1/18/2012	2/1/2012	180	61	500000	104005	Excellent	0.158		11/19/2021
5377	2011 Gillig 35' Hybrid	7/1/2011	8/5/2011	180	55	500000	170440	Excellent	0.191		
5378	2011 Gillig 35' Hybrid	7/1/2011	8/2/2011	180	55	500000	165449	Excellent	0.153		
5379	2011 Gillig 35' Hybrid	7/1/2011	8/2/2011	180	55	500000	205302	Excellent	0.238		
5380	2011 Gillig 35' Hybrid	7/1/2011	8/2/2011	180	55	500000	183476	Excellent	0.264	8/27/2018	
5381	2011 Gillig 35' Hybrid	7/1/2011	8/1/2011	180	55	500000	169435	Excellent	0.28	5/14/2020	
5382	2011 Gillig 35' Hybrid	7/1/2011	8/1/2011	180	55	500000	171508	Excellent	0.289	5/4/2020	
5383	2011 Gillig 35' Hybrid	7/1/2011	8/3/2011	180	55	500000	81452	Excellent	0.306	6/6/2019	
5384	2009 Gillig 35' Hybrid	10/15/2008	10/20/2008	180	14	500000	44743	Good	0.275	3/29/2019	
5385	2007 Gillig 35' Hybrid	1/4/2008	2/14/2008	180	14	500000	-42662	Good	0.374	3/9/2018	
5386	2007 Gillig 35' Hybrid	1/4/2008	2/14/2008	180	14	500000	67	Good	0.463	7/31/2018	
5401	2008 Ford 4WD Escape	8/10/2007	8/13/2007	120	-53	150000	114083	Good	0.049		
5402	2008 Ford 1 ton 4x4 service truck	5/8/2008	5/12/2008	120	-43			Good	0.188		
5404	2015 Bobcat Tool Cat	6/1/2015	6/1/2015					Good	2.57		
5405	2012 Ford 1 ton 4x4 service truck	2/24/2012	2/27/2012	120	26			Excellent	0.131		
5406	2008 Chev Uplander w/lift (DELETE- GONE)	11/16/2007	11/26/2007	204	34			Good	0.157		
5407	2016 Ford F450	1/12/2016	1/13/2016	120	49			Excellent	0.05		
5408	2014 Mobility Venture	4/29/2016	5/9/2016	120	53			Excellent	0.03		
5409	2015 Mobility Venture	6/30/2017	8/8/2017	120	66			Excellent	0.072		
5411	2003 Chevy 3/4 ton truck	6/30/2003	6/30/2003	120	-103			Adequate	0.202	1/28/2021	
5426	2006 Contrail Traile	3/15/2006	3/15/2006					Excellent	0		
5427	2006 Bobcat Tool Cat	2/6/2006	2/15/2006					Adequate	5.56		
5428	2000 Yale Forklift	4/10/2012	4/10/2012					Adequate	0.322		
5455	2001 Ford Goshen Van w/lift	9/4/2003	9/4/2003	96	-143	150000	-61862	Adequate	0.194		
5456	2006 Ford Eldorado Van w/lift - DELETE GONE	7/1/2006	7/26/2006	96	-89	150000	-36267	Adequate	0.237		
5458	2007 Ford E-450 Eldorado Aerotech w/lift	8/21/2007	9/12/2007	96	-76	150000	-35584	Adequate	0.18		
5459	2007 Ford E-450 Eldorado Aerotech w/lift	8/21/2007	9/12/2007	96	-76	150000	-20601	Adequate	0.2		
5460	2007 Ford E-350 Eldorado Aerolite w/lift	8/21/2007	11/16/2007	96	-73	150000	36524	Good	0.163		
5561	2010 Chev Arboc Express 3500 w.ramp (DELETE move to non revenue	7/2/2010	7/13/2010	96	-41	150000	-32906	Good	0.205		
5562	2013 Ford E-450 Eldorado Aerotech w/lift	1/3/2013	1/14/2013	96	-11	150000	25647	Excellent	0.147	2/21/2017	
5563	2013 Ford E-450 Eldorado Aerotech w/lift (DELETE) move to non-revenue	1/3/2013	1/18/2013	96	-11	150000	7623	Excellent	0.125		
5564	2013 Ford E-450 Eldorado Aerotech w/lift	1/3/2013	1/14/2013	96	-11	150000	24560	Excellent	0.106	2/23/2017	
5565	2013 Ford E-450 Eldorado Aerotech w/lift - WILL BE GONE/DIED	1/3/2013	1/14/2013	96	-11	150000	35198	Excellent	0.212	8/28/2018	



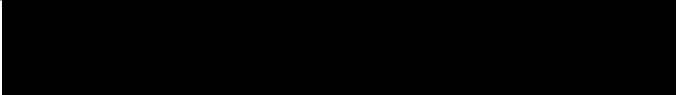

Name	Description	Purchased Date	In Service Date	Useful Life (Months)	Remaining Useful Life (Months)	Useful Life (Odometer)	Remaining Useful Life (Odometer)	Condition Assessment	Cost Per unit (Life)	Mid-Life Date	Battery Refresh Kit
5566	2013 Ford E-450 Eldorado Aerotech w/lift	1/3/2013	1/14/2013	96	-11	150000	19399	Excellent	0.076		
5567	2015 Ford E-450 Starcraft w/lift	3/6/2015	3/17/2015	96	15	150000	62228	Excellent	0.145	8/25/2019	
5568	2015 Ford E-450 Starcraft w/lift	3/6/2015	3/17/2015	96	15	150000	69360	Excellent	0.087		
5569	Champion Low Floor	6/16/2021	5/5/2021	96	90	150000	142476	Excellent	0.01		
5570	CHAMPION LOW FLOOR	6/16/2021	5/5/2021	96	90	150000	143642	Excellent	0.01		



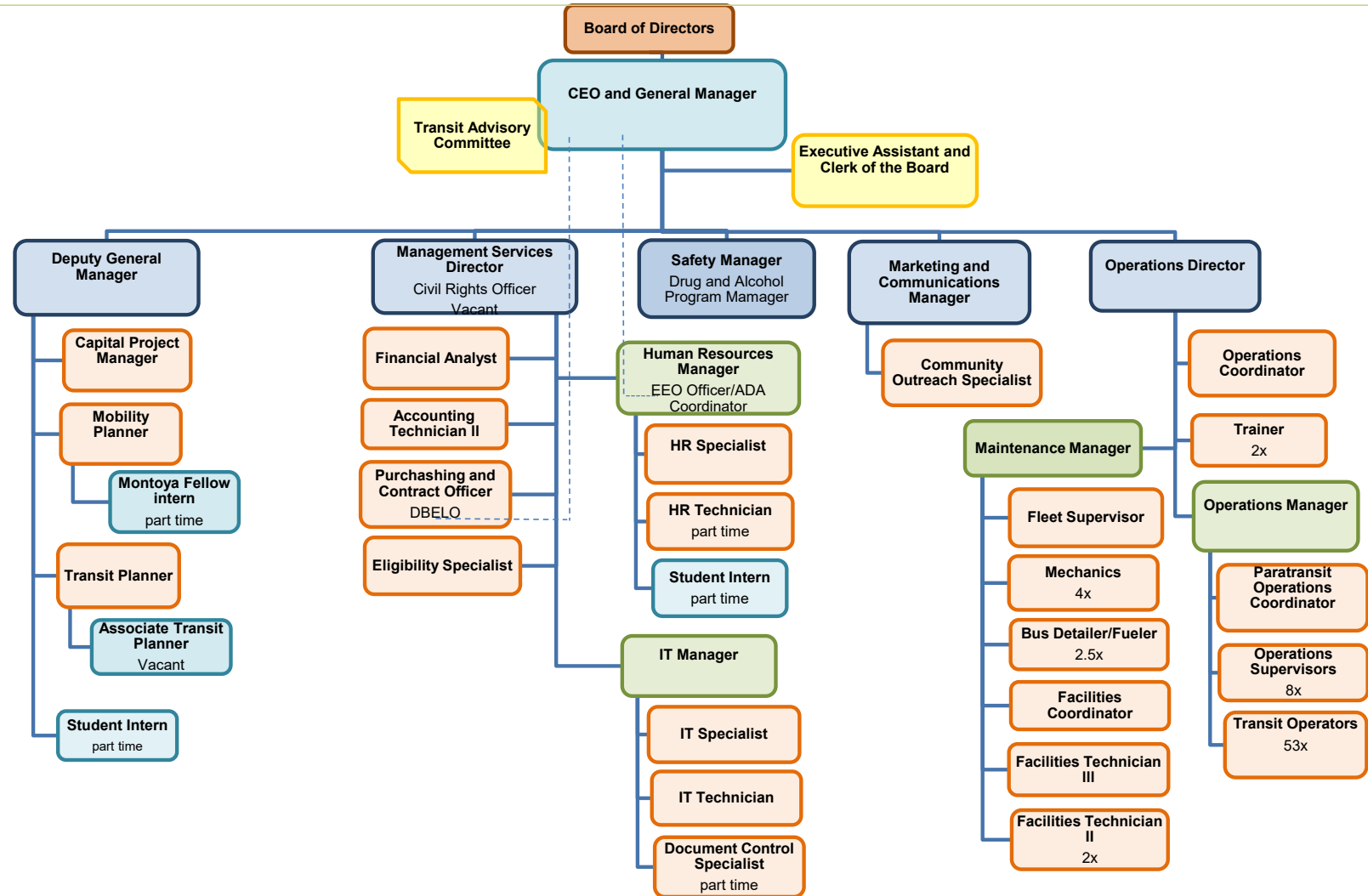


## Appendix C

### Mountain Line Staff Organizational Chart





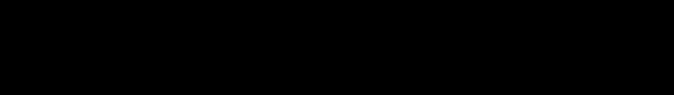







# Appendix D

## Mountain Line Staff Growth Table





## FY2022 FT EQUIVALENT LIST

Position	FY2022 Base	Change	FY2043 Base
<i>(REGULAR - both FTE and PTE)</i>			
Accounting Technician II	1.00	1.00	2.00
Bus Detailer/Fueler (2 FTE, 1 PTE)	2.50	-1.50	1.00
Capital Project Manager	1.00		1.00
CEO & General Manager	1.00		1.00
Community Outreach Coordinator	0.00	0.00	0.00
Customer Service Representative	1.00	1.00	2.00
Marketing Specialist	0.00	2.00	2.00
Executive Assistant/Clerk of Board	1.00		1.00
Deputy General Manager	1.00		1.00
Document Control Specialist-PT, Limited Appointment	0.50		0.50
Eligibility Specialist	1.00		1.00
Facilities Coordinator	1.00	0.00	1.00
Facilities Technician I	0.00	4.00	4.00
Facilities Technician II	2.00	1.00	3.00
Facilities Technician III	1.00	1.00	2.00
Financial Analyst	1.00	1.00	2.00
Fleet Supervisor	1.00	1.00	2.00
Human Resources Intern (unpaid, student)	0.50		0.50
Human Resources Manager	1.00		1.00
Human Resources Specialist	1.00	1.00	2.00
Human Resources Technician-PT	0.50	1.50	2.00
Information Technology Intern (unpaid, student)	0.50		0.50
Information Technology Manager	1.00		1.00
Information Technology Specialist	1.00	1.00	2.00
Information Technology Technician	1.00	1.00	2.00
Associate Transit Planner	1.00	1.00	2.00
Maintenance Manager	1.00	0.00	1.00
Management Services Director	1.00		1.00
Marketing and Communications Manager	1.00	0.00	1.00
Mechanic	4.00	5.00	9.00
Mobility Planner	1.00		1.00
Operations Coordinator	1.00	2.00	3.00
Operations Director	1.00		1.00
Operations Manager	1.00		1.00
Operations Supervisor	8.00	2.00	10.00
Paratransit Operations Coordinator	1.00	-1.00	0.00
Planning Intern (unpaid, student)	0.25	-0.25	0.00
Planning Intern, Montoya Fellowship	0.50	0.50	1.00
Purchasing and Contracts Officer	1.00		1.00
Safety Manager	1.00		1.00
Trainer	2.00		2.00
Transit Operator	53.00	47.00	100.00
Transit Planner	1.00	1.00	2.00
<b>Total Mountain Line Positions</b>	<b>101.25</b>	<b>71.25</b>	<b>172.50</b>

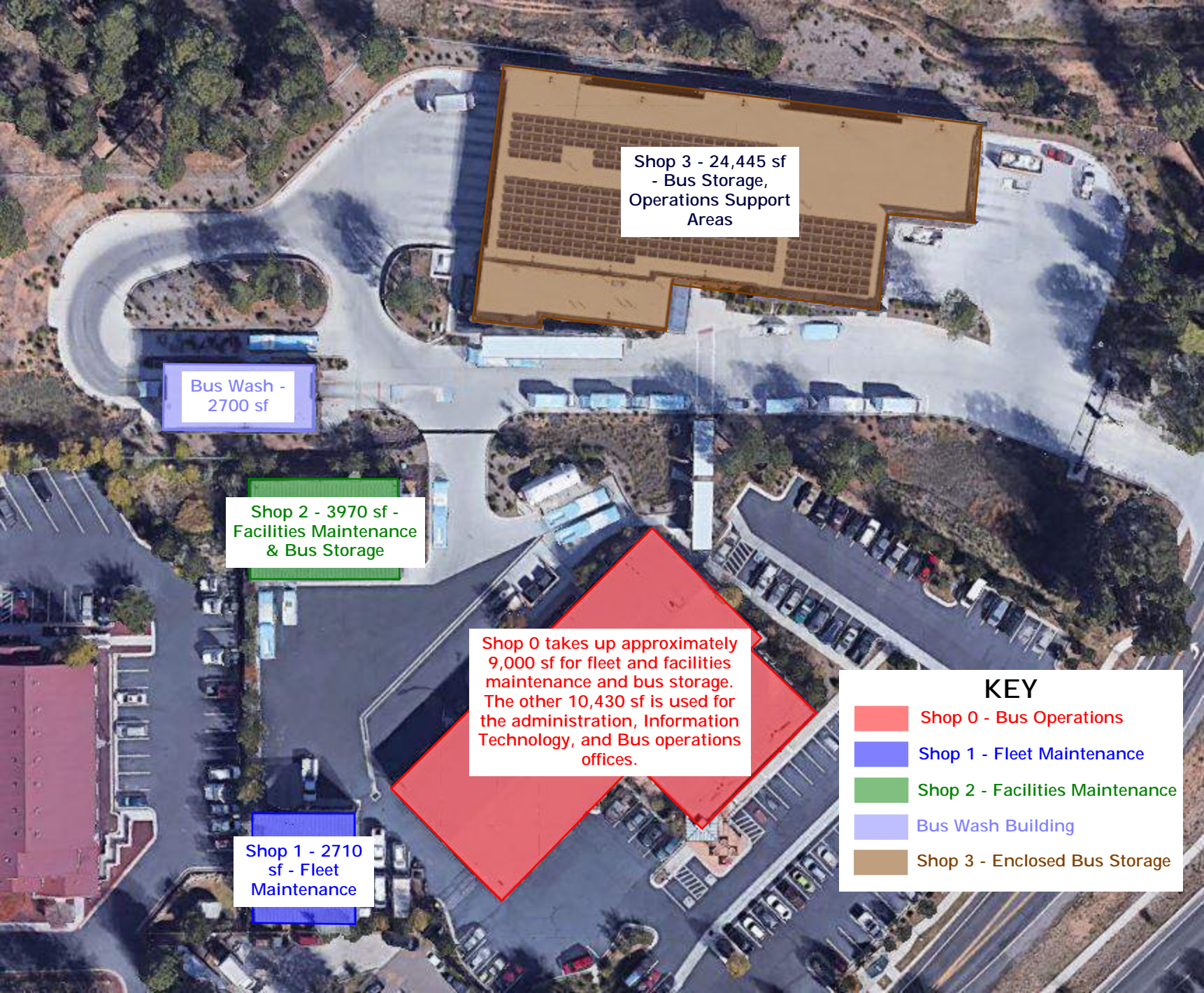




## Appendix E

### Spatial Diagrams





Shop 3 - 24,445 sf  
- Bus Storage,  
Operations Support  
Areas

Bus Wash -  
2700 sf

Shop 2 - 3970 sf -  
Facilities Maintenance  
& Bus Storage

Shop 0 takes up approximately  
9,000 sf for fleet and facilities  
maintenance and bus storage.  
The other 10,430 sf is used for  
the administration, Information  
Technology, and Bus operations  
offices.

Shop 1 - 2710  
sf - Fleet  
Maintenance

**KEY**

	Shop 0 - Bus Operations
	Shop 1 - Fleet Maintenance
	Shop 2 - Facilities Maintenance
	Bus Wash Building
	Shop 3 - Enclosed Bus Storage

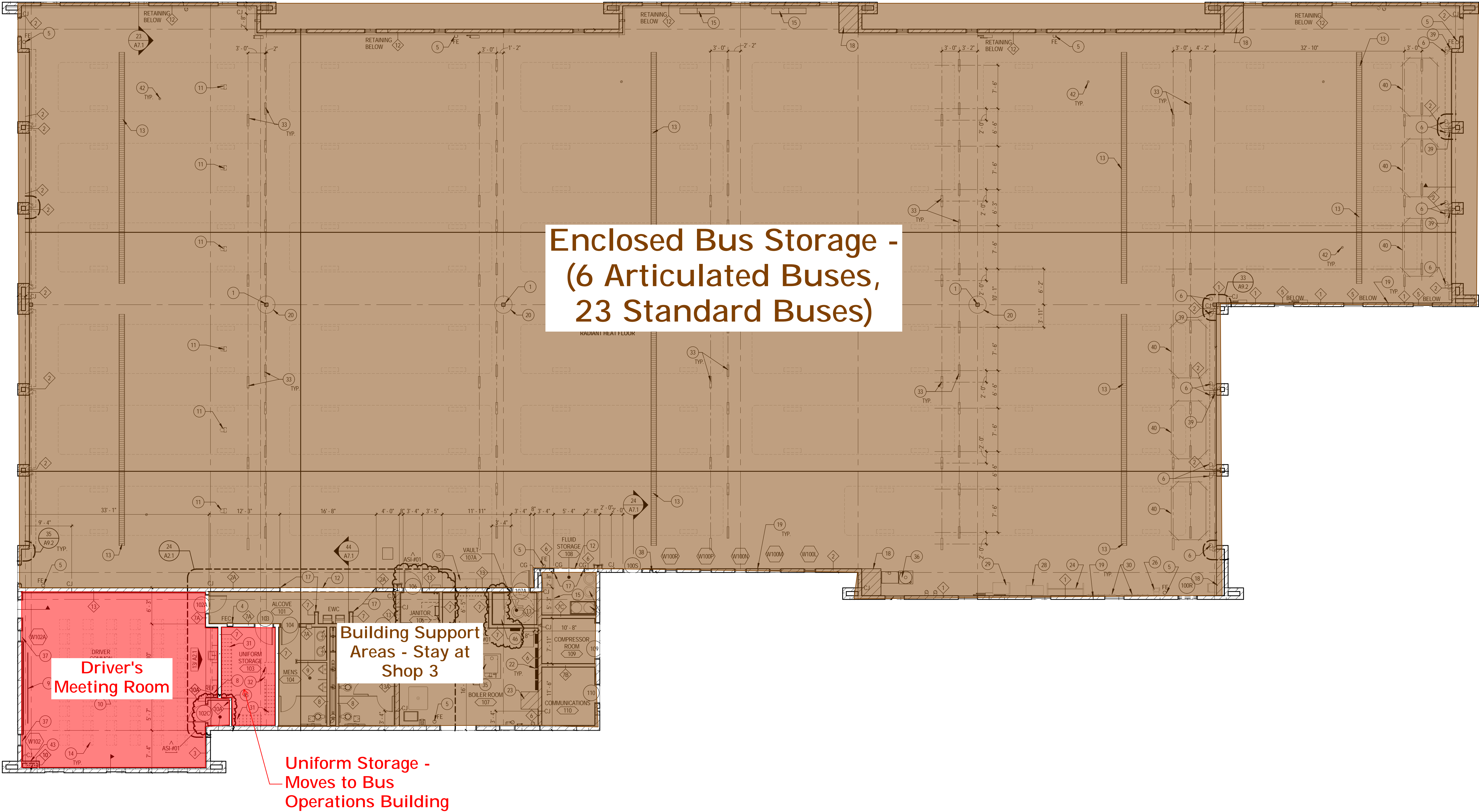


Spatial Diagram - "Shop 0" -  
Bus Operations Building





Spatial Diagram - "Shop 3" -  
Enclosed Bus Storage

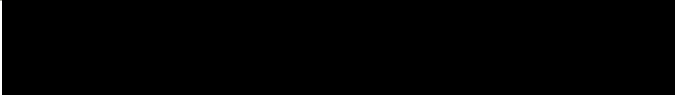







## Appendix F

### Kaspar O&M Costs Detail with Labor





O&M Costs Calculation

Kaspar Bus Operations and Maintenance Facility

Mountain Line

Operations			Labor			Materials		Total		Building Square Footage		28740		
1.0 Building Maintenance			# of Staff	Avg Cost /Staff		Annual Labor Costs	Annual Costs		Total Annual Cost		Notes			
1.1	Janitorial Services	Service Contract				\$ -	\$ 50,000.00		\$ 50,000.00		Three levels of the building			
1.2	Routine Deep Clean/Floors	Service Contract				\$ -	\$ 1,500.00		\$ 1,500.00					
1.3	HVAC Maintenance	Service Contract					\$ 2,500.00		\$ 2,500.00					
1.4	Equipment Maintenance	Fac Maintenance	0.025	\$ 44,464.00		\$ 1,111.60	\$ 2,000.00		\$ 3,111.60					
1.5	Lighting/Lamp Replacement	Fac Maintenance	0.025	\$ 44,464.00		\$ 1,111.60	\$ 2,000.00		\$ 3,111.60					
1.6	General Repairs	Fac Maintenance	0.025	\$ 44,464.00		\$ 1,111.60	\$ 4,500.00		\$ 5,611.60					
						\$ 3,334.80		\$ 62,500.00						
								Total		\$ 65,834.80				
2.0 Utilities			Unit	Cost /Unit		Annual Usage	Annual Cost		Total Annual Cost		Utility Variables		Notes	
2.1	Water		Gal	\$ 0.00769		353502	\$ 2,718.43		\$ 2,718.43		12.3 gallons per SF			
2.2	Sewer		Gal	\$ 0.00068		353502	\$ 240.38		\$ 240.38		22.4 cf per SF 9.6 kWh per SF			
2.3	Natural Gas		CFT	\$ 0.0079		643776	\$ 5,085.83		\$ 5,085.83					
2.4	Electricity		kWh	\$ 0.092		275904	\$ 25,493.53		\$ 25,493.53					
2.5	Telecommunications		LS	\$ 2,100.00		12	\$ 25,200.00		\$ 25,200.00					
2.6	Recycling/Waste Removal		LS	\$ 400.00		12	\$ 4,800.00		\$ 4,800.00					
						\$ 63,538.17								
						Total		\$ 63,538.17						
Total O&M Costs - Operations									\$ 129,372.97					
Bus Storage			Labor			Materials		Total		Building Square Footage		50809		
1.0 Building Maintenance			# of Staff	Avg Cost /Staff		Annual Labor Costs	Annual Costs		Total Annual Cost		Notes			
1.1	HVAC Maintenance	Service Contract					\$ 2,500.00		\$ 2,500.00					
1.2	Equipment Maintenance	Fac Maintenance	0.025	\$ 44,464.00		\$ 1,111.60	\$ 4,000.00		\$ 5,111.60					
1.3	Lighting/Lamp Replacement	Fac Maintenance	0.025	\$ 44,464.00		\$ 1,111.60	\$ 4,000.00		\$ 5,111.60					
1.4	General Repairs	Fac Maintenance	0.025	\$ 44,464.00		\$ 1,111.60	\$ 9,000.00		\$ 10,111.60					
						\$ 3,334.80		\$ 19,500.00						
						Total		\$ 22,834.80						
2.0 Utilities			Unit	Cost /Unit		Annual Usage	Annual Cost		Total Annual Cost		Utility Variables		Notes	
2.1	Water		Gal	\$ 0.00769		624951	\$ 4,805.87		\$ 4,805.87		12.3 gallons per SF			
2.2	Sewer		Gal	\$ 0.00068		624951	\$ 424.97		\$ 424.97		22.4 cf per SF 9.6 kWh per SF Assumes power for bus charging			
2.3	Natural Gas		CFT	\$ 0.0079		1138121.6	\$ 8,991.16		\$ 8,991.16					
2.4	Electricity		kWh	\$ 0.092		487766.4	\$ 45,069.62		\$ 45,069.62					
						\$ 59,291.61								
						Total		\$ 59,291.61						
Total O&M Costs - Bus Storage									\$ 82,126.41					







Facilities Maintenance Building			Labor			Materials	Total	Building Square Footage	6680
1.0	Building Maintenance		# of Staff	Avg Cost /Staff	Annual Labor Costs	Annual Costs	Total Annual Cost	Notes	
1.4	HVAC Maintenance	Service Contract				\$ 1,000.00	\$ 1,000.00	Filter Maintenance and Routine service	
1.5	Equipment Maintenance	Fac Maintenance	0.025	\$ 44,464.00	\$ 1,111.60	\$ 1,000.00	\$ 2,111.60		
1.6	Lighting/Lamp Replacement	Fac Maintenance	0.025	\$ 44,464.00	\$ 1,111.60	\$ 1,000.00	\$ 2,111.60		
1.7	General Repairs	Fac Maintenance	0.025	\$ 44,464.00	\$ 1,111.60	\$ 2,000.00	\$ 3,111.60		
					\$ 3,334.80	\$ 5,000.00			
					Total		\$ 8,334.80		
2.0	Utilities		Unit	Cost /Unit	Annual Usage	Annual Cost	Total Annual Cost	Utility Variables	Notes
2.1	Water		Gal	\$ 0.00769	36072	\$ 277.39	\$ 277.39	5.4 gallons per SF	
2.2	Sewer		Gal	\$ 0.00068	36072	\$ 24.53	\$ 24.53		
2.5	Natural Gas		CFT	\$ 0.0079	243152	\$ 1,920.90	\$ 1,920.90	36.4 cf per SF	
2.6	Electricity		kWh	\$ 0.092	50100	\$ 4,629.24	\$ 4,629.24	7.5 kWh per SF;\$0.092/kWh	
						\$ 6,852.06			
					Total		\$ 6,852.06		
			Labor			Materials	Total	Associated Site - Building	
3.0	Site Maintenance		# of Staff	Avg Cost /Staff	Annual Labor Costs	Annual Costs	Total Annual Cost	Notes	
3.1	Pavement Maintenance (Sweeping)	Service Contract				\$ 1,800.00	\$ 1,800.00	\$150 per month	
3.2	Signage and Markings	Service Contract				\$ 3,000.00	\$ 3,000.00	\$6000 Restriping - every 2 years	
3.3	Fence & Gates Annual Maintenance	Service Contract				\$ 1,500.00	\$ 1,500.00	General Maintenance Contract	
3.4	Exterior Lighting	Service Contract				\$ 4,000.00	\$ 4,000.00	Lamp Replacement	
3.5	Landscape/Irrigation Maintenance	Service Contract				\$ 1,200.00	\$ 1,200.00	Minimal - Draught Resistant Landscaping	
3.6	Oil/Water Separator Maintenance	Service Contract				\$ 3,200.00	\$ 3,200.00	\$800 4 x per year	
3.7	Underwater Stormwater Storage Maintenance	Service Contract				\$ 3,000.00	\$ 3,000.00	Material & Cleaning Supplies	
3.8	Canopy Maintenance & Cleaning	Fac Maintenance	0.025	\$ 44,464.00	\$ 1,111.60	\$ 1,200.00	\$ 2,311.60	Material & Cleaning Supplies	
3.9	Photovoltaic Panel Maintenance & Cleaning	Service Contract			\$ -	\$ 5,000.00	\$ 5,000.00	Replacement Parts and Panels	
					\$ 1,111.60	\$ 23,900.00			
					Total		\$ 25,011.60		
Total O&M Costs - Facilities Maintenance Facility							\$ 40,198.46		
					ML Labor	Materials & Services	Total Facility Annual Cost		
					\$ 16,674.00	\$ 299,179.54	\$ 315,853.54		





## Appendix G

### Basis of Design – Electrification of Vehicles





# Basis of Design – Electrification of Vehicles (Final)

Mountain Line

Kaspar Headquarters Master Plan

*Flagstaff, AZ 86004*

March 30, 2022





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# 1 Executive Summary

The HDR design team began working with Mountain Line in early 2022 to provide a design for electric bus charging infrastructure at the Kaspar Headquarters Facility in preparation for the Mountain Line conversion to battery electric buses. This Basis of Design document describes the decision process and the preliminary design elements for the installation of electric vehicle supply equipment at the Kaspar Headquarters Facility for which construction drawings and specifications will be generated and permit applications submitted.

The original fleet modeling and electrification plan was completed in December 2020 and was titled “*Mountain Line’s Zero-Emission Bus Implementation Plan*.” The plan detailed the charging needs at the Facility as well as those at on-route charging locations throughout the system. This Basis of Design focuses only on the chargers installed at the Kaspar Headquarters Facility at this time.

While the Zero-Emission Bus Implementation Plan called for two, 450 kW pantograph chargers to be installed at the Facility, Mountain Line staff have requested one, 450 kW pantograph charger at this time, due to available funds. The electrification design will install additional conduit for additional electrical capacity to install a 450 kW pantograph or 500 kW induction charger in the future, as defined under Section 2 of this Basis of Design document.

Mountain Line staff and the design team have engaged with the local electrical utility company, Arizona Public Services (APS), to discuss the ability to serve the charging loads. APS has stated that installing the appropriate equipment at the Facility will require between three to six months. APS stated that the existing distribution system is capable of handling the 900 kW load for future charger installations.

Another key component of the design is the chargers. There are a handful of bus charger manufacturers that meet Buy America requirements within the United States of America. Bus manufacturers generally have specific preferences for the charging equipment that works best with their buses. Based on research by Mountain Line, a charger manufacturer that is approved/preferred by both Gillig and New Flyer buses is required by Mountain Line.

Mountain Line has subsequently elected to purchase ABB chargers, using the State of Washington’s direct source contract. ABB was contacted during the charger selection process and confirmed their capability of providing both the 150 kW plug-in and 450 kW pantograph chargers. Mountain Line is working to finalize the charger procurement, and the design team will design around the selected charger. Since the conversation with ABB, Mountain Line has now elected to only install the 450 kW pantograph charger at this time.

Mountain Line has ordered the battery electric buses and they are scheduled for delivery in November 2022. Due to current worldwide supply issues and the anticipated time required to develop a comprehensive design document package to properly bid the project, it is likely that the two selected chargers will not be in service until early 2023. As a result, Mountain Line is considering potential solutions for temporary short-term



charging, including the possibility of utilizing a 50 kW mobile charger, which is addressed under Section 3 of this Basis of Design document.

## 2 Fixed Charger Selection & Design (Scope A)

### 2.1 Introduction

Mountain Line is the public transit agency serving the Flagstaff area with a fleet storage, maintenance and administration facility located on Kaspar Drive, Flagstaff, Arizona. Mountain Line provides Flagstaff and the surrounding communities with 9 different lines.

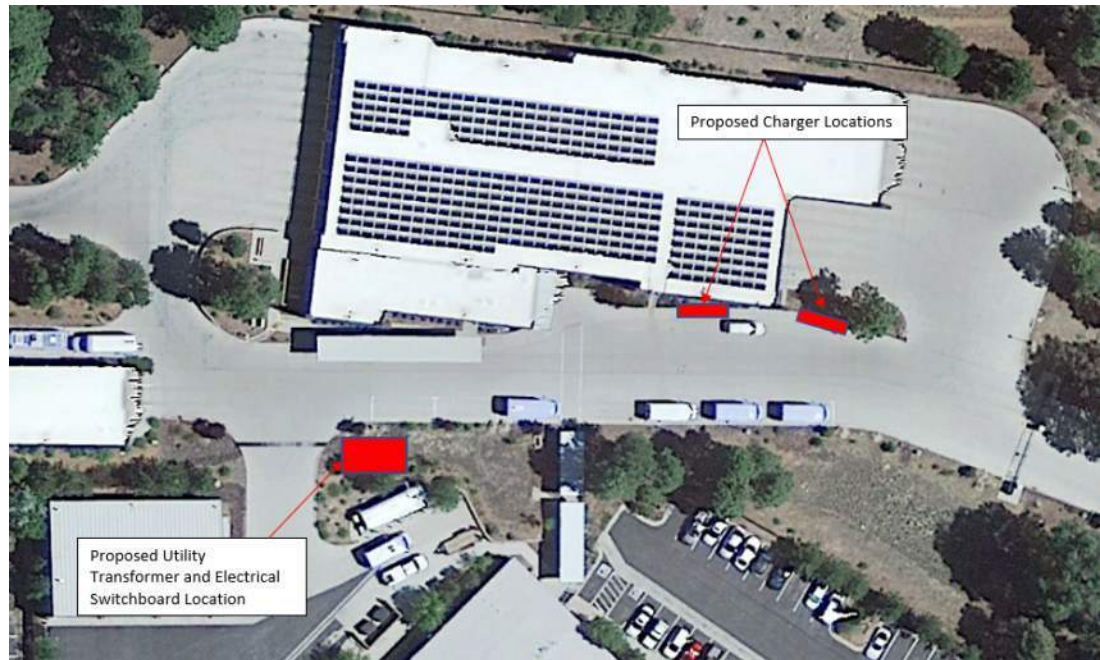
The Kaspar Headquarters Master Plan (KHMP) will include the planning and implementation for conversion to Battery Electric Buses (BEB). The BEB charging infrastructure will be installed as part of the KHMP. While Mountain Line's first BEBs are scheduled to arrive in Winter 2022, it is anticipated that charging infrastructure design, procurement and construction will not likely be completed until Spring 2023. The desire to plan for temporary charging through mobile electrification to enable immediate use of the newly-procured buses upon arrival is discussed in Section 3 within this report.

### 2.2 Methodology

#### 2.2.1 Zero-Emission Bus Implementation Plan

The most successful BEB deployment projects begin with adequate planning. Mountain Line's Zero-Emission Bus Implementation Plan, dated December 2020, outlines the BEB charging needs for the entire bus fleet. According to the Implementation Plan, 19 BEBs would receive electric charging at the Kaspar Headquarters Facility. The buses would be charged using 450 kW overhead chargers at the end of each service day. Charging at the Kaspar Headquarters Facility would only supplement on-route charging provided at the Downtown Connection Center (DCC) and would not be relied upon to charge the entire battery of each bus. A preliminary bus charging layout from the Implementation Plan is shown in Figure 2-1.





**Figure 2-1 – Kaspar Headquarters Conceptual Charging Layout**

## 2.2.2 Preliminary Layout Refinement

The Mountain Line and HDR design team reviewed the potential charging locations, the available utility power, the charger sizes and the potential costs. Following several stakeholder discussions including with Arizona Public Service (APS), Mountain Line identified the preferred locations and the charger sizes on February 2, 2022. That direction for the permanent chargers included the following:

- One fast charger (450 kW pantograph) near the southeast corner of Shop 3.
- Conduit installed across drive area to support future installation of 450 kW pantograph or 500 kW inductive charger in the future. Conduit would only be installed at this time.

Figure 2-2 shows the preliminary charger design layout, based on the direction given on February 2, 2022 and corresponding preliminary conversations with APS.

The 450 kW charger is a pantograph-style charger. The charging cabinets are approximately 80"H x 139"W x 31"D for all three cabinets in total. The pantograph charger unit is approximately 207" tall and extends approximately 184" over the drive path.

The induction charger is a potential installation option for a second, future charger. The size and charging technology has not yet been determined by Mountain Line, but there appears to be ample room near the southeast corner of Shop 3. Conduit would be installed to the approximate charger location and terminated within an underground junction box. The conduit will be sized to accommodate an electrical load of up to 500 kW. However, the circuit breaker, conductors and charger would be installed at a future time.



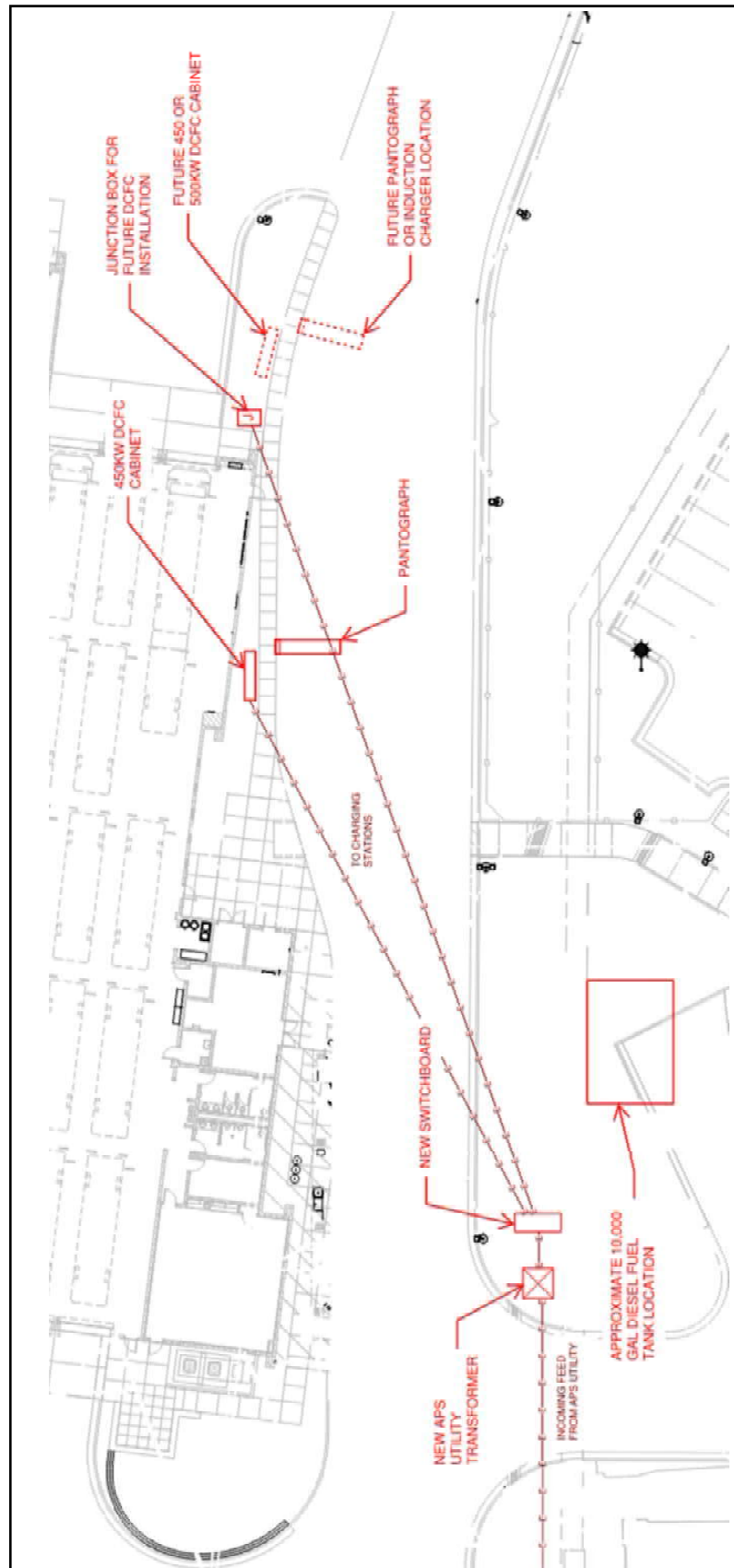


Figure 2-2 – Preliminary Charger Design Layout



## 2.3 Utility Interconnection

As a member of the HDR design team, Affiliated Engineers, Inc. (AEI) provided a load summary, which indicates the spare capacity of the existing utility services on site. The existing utility service only has capacity to support two, 150 kW chargers. With the full charger load, the existing electrical infrastructure does not have enough capacity to support all of the new charging equipment requested by Mountain Line. Therefore, a new utility service must be installed. The service will include a new pad-mount utility transformer provided and installed by APS. The new transformer will feed a new 3000A, 480Y/277V, 3-phase, 4-wire, NEMA 3R service entrance switchboard. This provides adequate capacity for the new and future chargers (two, 450 kW chargers each).

Based on general experience with similar projects, it is expected that the switchboard will take approximately 16 to 20 weeks for procurement, which appears to be one of the longer lead items. The utility expects to install their transformer within 12 weeks of permitted documents.

Figure 2-2 shows the approximate location of the new utility transformer and the new switchboard. The exact location will be refined during design development to factor in the utility clearance requirement needs and the final direction of equipment placement from Mountain Line.

## 2.4 Charger Selection

ABB provided charging information during the Zero-Emission Bus Implementation Plan and is also selected as a preferred charger for New Flyer and Gillig buses. ABB also manufactures 450 kW pantograph chargers, so Mountain Line has decided to procure ABB chargers from the State of Washington purchasing contract. Mountain Line conducted a phone conversation with the design team and ABB on March 2, 2022 to discuss the offerings available under this contract. Kendell Whitehead of ABB indicated that ABB chargers available through the State of Washington contract were administered through New Flyer and Gillig as the bus providers, so Mountain Line decided to work through New Flyer.

For this application, the ABB HVC-PD 450 kW E-Bus Charger will be utilized as the 450 kW charger (Figure 2-3). The 450 kW model uses a pantograph style connection and requires a 480V, 3-phase input, which will be fed from the new switchboard.

The charger requires internet access. Wireless internet is commonly used and anticipated for this project. However, the chargers will also accept a standard RJ45 connector, if wired is preferred or wireless is not an option. A hardwired connection is often required between the charger and dispenser, though it is not generally required between the charger and Mountain Line's IT network. Appendix A – ABB Charger Information provides additional charger documentation.

Software is available from multiple vendors to improve operation of the electric fleet. Depending on the owner needs, the software is capable of tracking vehicle state of charge, optimizing charging for lower electrical consumption, diagnosing and remotely repairing some charger faults, often much more. While ABB offers a software package of their own, the ABB chargers also operate the latest Open Charge Point Protocols (OCPP) which



allow many additional third-party vendors such as Viricity, Mobility House, and others to provide a robust package that can integrate the buses and charging as well as building energy consumption and potential renewable resources or battery storage, if desired.



**Figure 2-3 – ABB 450 kW DCFC and Pantograph**

## 2.5 Electrical Engineering

### 2.5.1 Summary

Electrical systems for the Mountain Line Electrification project will consist of the following:

- One (1) new utility transformer provided and installed by Arizona Public Service (APS).
- One (1) new 3000A, 480/277V, 3 phase, 4 wire, NEMA 3R electrical service entrance switchboard.
- Low-impedance grounding system.
- Surge protection on the load side of the new electrical service.
- Power factor correction, if required.
- Underground branch circuiting to one (1) 450kW, 480V, 3 phase, 3 wire + ground electric bus charging station.
- Raceway infrastructure for one (1) future 450 to 500kW, 480V, 3 phase, 3 wire + ground electric bus charging station. Conduit to be installed during initial deployment. Circuit breaker, conductors, and charger will be installed during a future phase.



- Spare conduits and Christy pull boxes will be provided on-site to account for future expansion.
- If required, new LED pole and wall mounted luminaires. Luminaires will match existing fixtures already installed on-site.

## 2.5.2 Base Design Criteria

### Design Voltages

Type	Voltage
Electrical Service	480Y/277V, 3 phase, 4 wire + ground
Electric Bus Chargers	480V, 3 phase, 3 wire + ground

## 2.5.3 Equipment Sizing Criteria

### Branch Circuit Sizing Criteria

Type	Load
Lighting (if required)	Actual Installed VA
Electric Bus Chargers	Actual Installed VA

### Diversity Factor

Diversity factors will be used in establishing power service, feeder and equipment capacities. The diversity factor represents the ratio of the sum of the individual non-coincident maximum demands of various subdivisions of the system to the maximum demand of the complete system. The diversity factors will be established using historical data from similar installations in conjunction with industry standards.

### Long Continuous Load (LCL)/Demand Factors Criteria

Type	LCL Factor
Lighting (if required)	125% of installed VA
Electric Bus Chargers	125% of installed VA

## 2.5.4 Electrical Service

### System Description

The Facility will be fed from a single utility transformer, provided and installed by Arizona Public Service (APS).

The utility will provide a single 480V, 3 phase feeder to connect to the new 3000A, 480/277V, 3 phase, 4 wire, NEMA 3R service entrance switchboard.

### Design Criteria

The primary system service capacity will be designed to serve the calculated connected load of the electric bus chargers plus additional spare capacity to accommodate future



equipment upgrades and site expansion. Refer to section 2.5.6 for anticipated spare capacity and space.

Surge protection shall be provided at the main service entrance switchboard.

## 2.5.5 Emergency/ Optional Standby Power System

### System Description

Backup power generation is not currently anticipated. However, provisions will be provided in the new electrical service entrance switchboard for future upgrades. If required, description of the anticipated future system is discussed herein.

The emergency power source for the site will consist of an Emergency Power Supply (EPS) coupled to an Emergency Power Supply System (EPSS). The EPS will include a single, tier 4, diesel operated, engine generator set with provisions to add additional generator sets, if needed. A day tank installed at the base of the generator will have adequate capacity to operate the generator at full load for at least 24 hours.

The EPS will be a Level 2 system per NFPA 110.

The emergency/ optional standby power generator will be located exterior to the existing buildings in a sound attenuated enclosure. The generator set will be mounted on a concrete-filled inertia base mounted on spring isolators.

The emergency/optional standby power will be distributed to multiple automatic transfer switches segregated by system.

## 2.5.6 Electrical Distribution

### Normal Power Distribution

#### *Design Criteria*

Electrical service size will be based on estimated demand load plus known and anticipated future loads. At a minimum, the service will support 50% spare capacity and 50% spare space to accommodate functional changes over the life of the Facility.

Power factor correction will be considered in the design of the power distribution system to bring the calculated power factor to 0.9 or better.

#### *Equipment and Components*

Equipment	Description of Components
Switchboards	UL 891 construction Front access NEMA 3R enclosure Copper Bus Main Circuit Breaker Electronic trip circuit breakers with field-adjustable and field-changeable trip units will be used for all circuit breakers. Circuit breakers 800 amps and greater will be UL listed for applications at 100% of their continuous ampere rating in their intended enclosure



## 2.5.7 Grounding System

### System Description

A complete low-impedance grounding electrode system will be provided. The grounding electrode system will include (1) three-pronged ground rod counterpoise system. The equipment grounding system will extend from the building service entrance switchboard to each branch circuit. All grounding system connections will be made using exothermic welds.

All feeders and branch circuits will be provided with an equipment ground conductor. Under no circumstances will the raceway system be used as an equipment grounding conductor.

Bonding jumpers will be provided as required across expansion/deflection couplings in conduit systems.

### Design Criteria

The grounding electrode system will be designed in accordance with NEC article 250.

System resistance to ground will be 5.0 ohms or less. Upon completion of the installation, the electrical contractor will perform fall-of-potential testing and submit results to engineer of record. Additional ground rods may be required to accommodate the targeted impedance for the system.

### Distribution

The main service entrance neutral will be bonded to the system ground bar within the switchboard by a removable bus bar link.

A separate ground wire will be provided for all circuits.

## 2.5.8 Lighting Systems (if required)

### System Description

Minimal site lighting is currently anticipated. If required, new LED pole and wall mounted exterior luminaires will be provided to match existing fixtures already installed on-site. Color temperatures will be provided in accordance with City of Flagstaff regulations. New luminaires will be tied to the existing exterior lighting control system.

### Illuminance Levels Design Criteria

Space	Average Maintained Footcandles (fc)
Open Parking	0.5 fc
Covered Parking	1-2 fc
Exterior Lighting	1-2 fc



### Lamps and Ballasts

LED lamps to be LM-79 and LM-80 tested, have two step MacAdam ellipse tolerance, and have a minimum CRI of 70 to be supplied with applicable drivers or power supplies.

### Lighting Control

New luminaires will be tied to the existing exterior lighting control system and will operate from dusk to dawn.

### Distribution

In general, new lighting will be tied to the existing electrical distribution system and will be either 277V or 120V.

## 2.5.9 Electrical System Standards

### Feeder and Branch Circuits

Feeder and branch circuit sizes will be based on the load supplied and adjusted for voltage drop. Adjustments to feeders and branch circuits will be as follows:

Circuit Voltage Length	Wire Size
480Y/277 volt circuits over 150' in length	Increase wire size one size for each 150' of length

Feeder and branch circuit ampacity will not be smaller than the upstream overcurrent device or downstream equipment bus.

### Overcurrent Protective Device Coordination

Overcurrent protective device will be selectively coordinated with supply side overcurrent protective devices as follows:

System	Seconds
Normal Power System	0.10

### Arc Flash

The electrical distribution system will be configured to allow equipment to be worked on energized using reasonable PPE (category 3 or less). Arc flash calculations for Arc Flash Incident Energy (AFIE) levels and flash protection boundary distances will be by the contractor based on the actual equipment supplied using an independent Registered Engineer in the State of Arizona using SKM System Analysis tools.

### Fault Current Ratings

The preliminary available fault current and short circuit ratings will be determined during design of the project and will be verified by 3rd party calculations provided in contractor submittals.

Equipment will have ratings not less than the calculated symmetrical short circuit value at each point in the distribution system.



Equipment will be fully rated for the calculated available short circuit. Series ratings will not be allowed.

### Conduit and Raceway

Electrical metallic tubing (EMT) will be run concealed, unless installed in mechanical, electrical, telecom, interstitial areas and other similar unfinished spaces.

EMT fittings will be compression type with steel body.

Minimum conduit size for power circuits will be 3/4".

Conduits will be independently supported.

Conduits below grade will be schedule 80 PVC encased in ductbanks or direct buried under slab. All conduit stub-ups from below slab will be galvanized rigid steel.

### Wire and Cable

The anticipated cable types are as follows:

Cable Types		
Voltage Class	Insulation	Notes
600 V	THHN, THWN-2 or XHHW-2	Conductors #10 and smaller will be solid copper. Conductors larger than #10 will be stranded copper.

All feeder and branch circuit conductors to be 98% conductivity copper.

Minimum wire size #12 AWG, for all areas.

Feeder conductors will be terminated using compression lugs.

Conductor insulation color code will be as follows:

Conductor Color Code	
208Y/120V	480Y/277V
Phase A – Black	Phase A – Brown
Phase B – Red	Phase B – Orange
Phase C – Blue	Phase C – Yellow
Neutral – White	Neutral – Gray
Ground – Green	Ground – Green

### Grounding and Bonding

A separate, insulated equipment grounding conductor, sized per the National Electrical Code, will be provided within each raceway, with each end terminated on a suitable lug, bus, enclosure, or bushing.

### Surge Protection

Surge Protective Devices (SPD) will be used as design dictates. A single SPD device will be installed on the load side of each main service disconnects.

### Prohibited Materials and Construction Practices

Extra-flexible non-labeled conduit.



Conduit installation in concrete slabs.

Conduit less than 3/4" diameter.

Use of Incompatible Materials: Aluminum fittings and boxes will not be used with steel conduit. All materials in a raceway system will be compatible.

Direct burial electrical cable.

### Power Distribution Acceptance Testing

An independent testing firm will be employed to assure all electrical equipment, both contractor and Owner supplied, is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.

The testing firm will be a corporately and financially independent testing organization that can function as an unbiased testing authority, professionally independent of the manufacturer, supplier, and installers of equipment or system evaluated by the testing firm. The testing firm's on-site technical person will be currently certified by the International Electrical Testing Association in electrical power distribution system testing. Items to be tested and inspected are as follows:

Acceptance Tests	
Switchboards	Ground Fault Protection Systems
Low-Voltage Power Circuit Breakers	Grounding Systems
Low-Voltage Insulated-Case/Molded-Case Circuit Breakers	Surge Protective Devices

### Power Distribution Acceptable Manufacturers

Acceptable Manufacturers	
Low Voltage Distribution Equipment	Cutler Hammer, Square D, GE, Siemens

## 3 Mobile Charger Design (Scope B)

### 3.1 Introduction

As previously stated, it is likely that the charger installation will not be completed until after the buses have arrived at the site. Mountain Line has discussed several options to provide temporary charging solutions while the chargers are constructed. Mountain Line has discussed purchasing 50 kW mobile chargers within the existing shops. The HDR design team has reviewed the load requirements of these chargers and the existing electrical infrastructure at the Kaspar Headquarters Facility to determine the necessary improvements. Mountain Line has determined to utilize 50 kW, Heliox mobile chargers for this mobile charger design (Figure 3-1). The Heliox chargers are also approved for use by New Flyer and Gillig. Additional cut sheet information on this charger is provided in Appendix B – Heliox Mobile Charger Information.





FAST DC 50

**Figure 3-1 – Heliox 50 kW Mobile Charger**

## 3.2 Electrical Engineering

### 3.2.1 Summary

Electrical scope of work for the requested mobile charging units will consist of the following:

- Existing APS transformer located at administration building and associated feeder to remain.
- Modification to existing fused switch located in existing 1000A, 480/277V, 3 phase, 4 wire service entrance switchboard located at administration building. Existing electrical service currently serves shops 1 and 2.
- Modification to existing feeder currently serving shop 1 and 2.
- Shop 1
  - One (1) new 225A, 480/277V, 3 phase, 4 wire panelboard.
  - Installation of branch circuiting for two (2), 480V, 3 phase, 3 wire + ground mobile charging units.
- Shop 2
  - One (1) new 225A, 480/277V, 3 phase, 4 wire, panelboard.
  - Installation of branch circuiting for one (1), 480V, 3 phase, 3 wire + ground mobile charging unit.
- Shop 3



- Existing 800A, 480/277V, 3 phase, 4 wire service entrance switchboard to remain.
- Installation of branch circuiting for five (5), 480V, 3 phase, 3 wire, + ground mobile charging units. Branch circuits will originate from existing electrical distribution equipment DB1 and HB1 located in shop 3 electrical room.

Figure 3-2 denotes approximate locations for new and existing equipment previously mentioned.

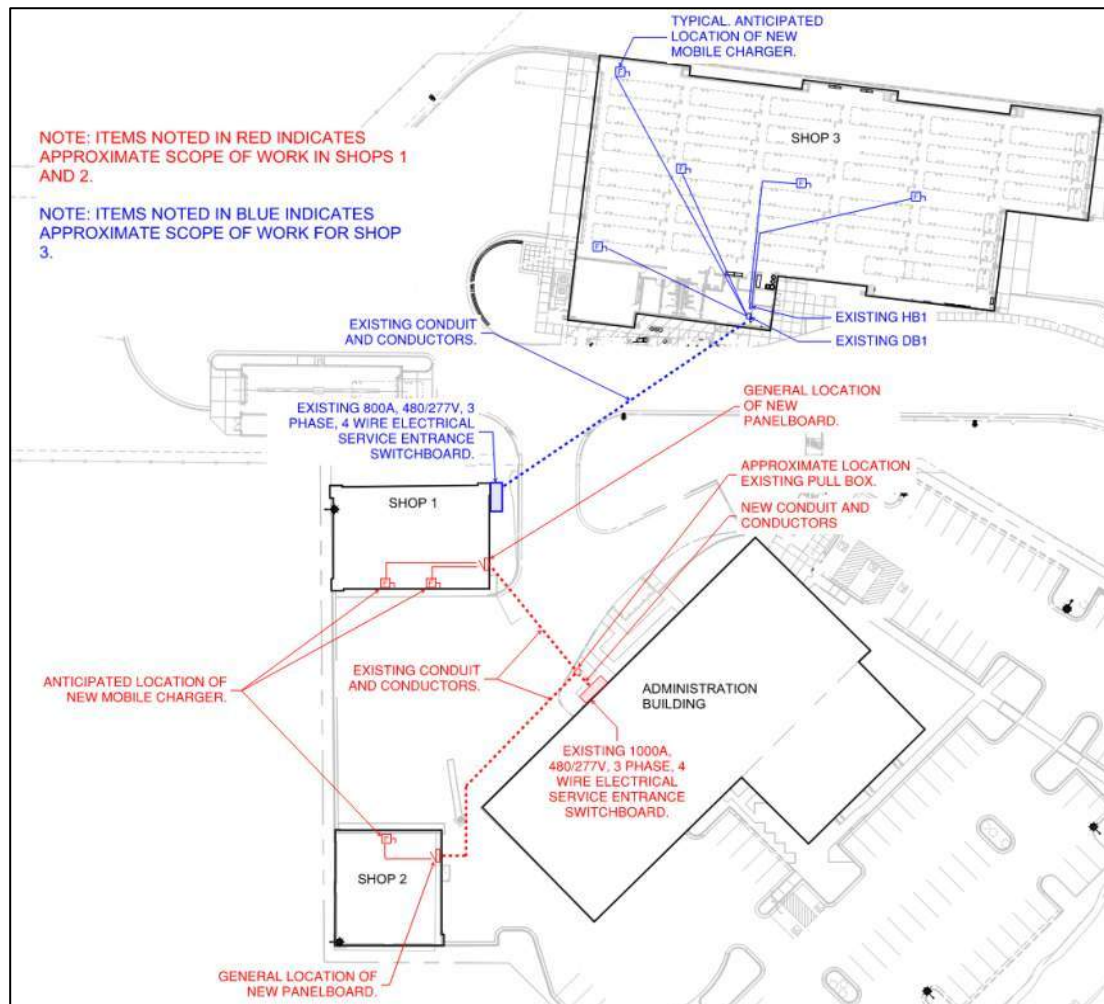


Figure 3-2 – Site Plan



### 3.2.2 Base Design Criteria

#### Design Voltages

Type	Voltage
Mobile Charging Unit	480V, 3 phase, 3 wire + ground

### 3.2.3 Equipment Sizing Criteria

#### Branch Circuit Sizing Criteria

Type	Load
Mobile Charging Unit	Actual Installed VA

#### Diversity Factor

Diversity factors will be used in establishing feeder and equipment capacities.

#### Long Continuous Load/Demand Factors Criteria

Type	LCL Factor
Mobile Charging Unit	125% of installed VA

#### Electrical Service

##### *System Description*

##### Shop 1 and 2:

- Existing 1000A, 480/277V, 3 phase, 4 wire service entrance switchboard located on the north end of the administration building to remain.

##### Shop 3:

- Existing 800A, 480/277V, 3 phase, 4 wire service entrance switchboard located on the east end of shop 1 to remain.

##### *Design Criteria*

##### Shop 1 and 2:

Existing 200A, 3 pole fused switch currently serving shop 1 and 2 will be removed. One (1) new 400A, 3 pole fused switch will be installed to serve two (2) new 225A, 480/277V, 3 phase, 4 wire panelboards.

##### Shop 3:

Modifications are not currently anticipated for the existing electrical service associated with the shop 3 scope of work.



### 3.2.4 Electrical Distribution

#### Normal Power Distribution

##### *System Description/Design Criteria*

##### Shop 1

- One (1) new 225A, 480/277V, 3 phase, 4 wire panelboard will be installed in shop 1 to serve two (2) mobile charging units.

##### Shop 2:

- One (1) new 225A, 480/277V, 3 phase, 4 wire panelboard will be installed in shop 2 to serve one (1) mobile charging unit.

##### Shop 3:

New electrical distribution is not currently anticipated. Connections for mobile charging units in shop 3 will be fed from existing electrical distribution DB1 and HB1 located in the shop 3 electrical room.

#### Equipment and Components

Equipment	Description of Components
Branch Panelboards	UL 67 listed 42 Pole, NEMA 1 enclosure, surface mounted Copper Bus Main Circuit Breaker Molded case with non-adjustable trip units to be used for all circuit breakers 100 amps and smaller All circuit breakers will be bolt-on style Panelboard covers will be hinged trim with door-in-door construction

### 3.2.5 Grounding System

#### System Description

All feeders and branch circuits will be provided with an equipment ground conductor. Under no circumstances will the raceway system be used as an equipment grounding conductor.

Bonding jumpers will be provided as required across expansion/deflection couplings in conduit systems.

#### Design Criteria

The grounding system will be designed in accordance with NEC article 250.

### 3.2.6 Electrical System Standards

#### Feeder and Branch Circuits

Feeder and branch circuit sizes will be based on the load supplied and adjusted for voltage drop. Adjustments to feeders and branch circuits will be as follows:



Circuit Voltage Length	Wire Size
480Y/277 volt circuits over 150' in length	Increase wire size one size for each 150' of length

Feeder and branch circuit ampacity will not be smaller than the upstream overcurrent device or downstream equipment bus.

### Arc Flash

The electrical distribution system will be configured to allow equipment to be worked on energized using reasonable PPE (category 3 or less). Arc flash calculations for Arc Flash Incident Energy (AFIE) levels and flash protection boundary distances will be by the contractor based on the actual equipment supplied using an independent Registered Engineer in the State of Arizona using SKM System Analysis tools.

### Fault Current Ratings

The preliminary available fault current and short circuit ratings will be determined during design of the project and will be verified by 3rd party calculations provided in contractor submittals.

Equipment will have ratings not less than the calculated symmetrical short circuit value at each point in the distribution system.

Equipment will be fully rated for the calculated available short circuit. Series ratings will not be allowed.

### Conduit and Raceway

Electrical metallic tubing (EMT) will be run concealed, unless installed in mechanical, electrical, telecom, interstitial areas and other similar unfinished spaces.

EMT fittings will be compression type with steel body.

Minimum conduit size for power circuits will be 3/4".

Conduits will be independently supported.

Conduits below grade will be schedule 80 PVC encased in ductbanks or direct buried under slab. All conduit stub-ups from below slab will be galvanized rigid steel.

### Wire and Cable

The anticipated cable types are as follows:

Cable Types		
Voltage Class	Insulation	Notes
600 V	THHN, THWN-2 or XHHW-2	Conductors #10 and smaller will be solid copper. Conductors larger than #10 will be stranded copper

All feeder and branch circuit conductors to be 98% conductivity copper.

Minimum wire size #12 AWG, for all areas.



Feeder conductors will be terminated using compression lugs.

Conductor insulation color code will be as follows:

Conductor Color Code	
208Y/120V	480Y/277V
Phase A – Black	Phase A – Brown
Phase B – Red	Phase B – Orange
Phase C – Blue	Phase C – Yellow
Neutral – White	Neutral – Gray
Ground – Green	Ground – Green

### Grounding and Bonding

A separate, insulated equipment grounding conductor, sized per the National Electrical Code, will be provided within each raceway, with each end terminated on a suitable lug, bus, enclosure, or bushing.

### Surge Protection

Surge Protective Devices (SPD) will be used as design dictates.

### Prohibited Materials and Construction Practices

Extra-flexible non-labeled conduit.

Conduit installation in concrete slabs.

Conduit less than 3/4" diameter.

Use of Incompatible Materials: Aluminum fittings and boxes will not be used with steel conduit. All materials in a raceway system will be compatible.

Direct burial electrical cable.



## Appendix A – ABB Charger Information (Scope A)



## — INSTALLATION ONE-PAGER

# HVC 450 E-Bus Charger

This one-pager briefly indicates the main relevant elements for the installation of the HVC bus charger. It can be used as a basic to determine the requirements for a site.

### General:

- The electrical installation should be designed and constructed according to local laws, safety and electrical regulations.
- A ground electrode should be installed in the earth close to the pole. The ground-resistance must be  $\leq 10 \Omega$ .
- More detailed information is available in the installation manual.

### Electrical installation



#### Main AC Power supply:

3x power switch 3P: 150kW  
9x fuse 3P: 300A (no neutral required)  
Option: 3x Surge Protected Device type 1

#### Input power cable:

3x AC power cable 3P+PE: 4x500 MCM maximum

#### Specification:

Nominal input voltage: 480V AC  $\pm 10\%$   
Nominal frequency: 60Hz  $\pm 1\%$   
Nominal input current: 567A  
Real input power: 495kW  
Power Factor ( $\cos \phi$ ):  $\geq 0.95$   
3G connection integrated

**Distribution board**



**HVC 450**

### Physical installation



#### Site requirements:

- The road inclination in driving direction of the bus should not be greater than  $5.0^\circ$
- Distance between bus and pole has to be 35.43 and 70.87 Inch.
- Recommended to make markings on the road for parking assistance.

#### Power Cabinet

- 1x HVC-150
- 2x HVC-150S

#### Placement (two options):

- 3x concrete foundation block  
27.56 x 46.06 x 51.18 Inch (HxWxD)
- 3x support frame for on existing floor

Dimensions: 79.92 x 138.19 x 30.31 Inch (HxWxD)  
Weight: 8862.58 lb

#### Cables between cabinet and charge control set:

Placed in conduit 1:  
6x DC power cable: 350 MCM  
Placed in conduit 2:  
1x Interlock cable: 2x16 AWG  
1x PE wire: 1x2 AWG  
1x AC utility power: 4x14 AWG  
4x communication: 8x glass fiber

Maximum distance between Power Cabinets and charge control set: 492.13 Foot.

2x conduit of  $\varnothing$  5.5 Inch between Power Cabinets and charge control set.

#### Charge control set:

- ACS Control Module
- Pantograph (ACS)
- WiFi communication unit (for the bus)
- Charge state indicator light

#### Optional

- Pole construction

#### Mechanical pole:

##### Dimensions

Height: 206.30 Inch  
Outreach: 183.86 Inch  
Mast with: 40.94 x 11.81 Inch  
Weight: 3306.93 lb

#### Placement (three options):

- Concrete foundation block  
26.77 x 94.49 x 94.49 Inch (HxWxD)
- Tube foundation
- Support frame for on existing floor




## Appendix B – Heliox Mobile Charger (Scope B)



# Mobile 50kW

Simple. Durable. Portable.

The Heliox Mobile charger is the perfect solution for workshops, bus depots or driving events. With a durable yet lightweight design built from the ground up for the daily activities of service and maintenance personnel.



Reliability on-the-go rapid DC charging where you need it

Perfect for getting started.  
Charging starts automatically when plugged in

heliox



# Mobile 50kW



**Durability:** A strong metal casing and wheel system means it stands up to daily wear and tear in ways other chargers simply cannot.



**Simplicity:** Mobility meets efficiency. Simply connect the charger to a standard 480V AC wall-socket and the charging process starts automatically.

**98%  
uptime**

## General

Charging standard	ISAE J1772
Communication standard	DIN70121 / ISO15118-1/2/3 ed1
Compliance and safety	UL 2202 / UL 2231
DC charging connection	CCS type-1 (IEC 62196)
Power factor above 50 % rated	> 0.98
Peak efficiency	95%
Dielectric withstand	3000 V
Network cellular	4G modem
Back Office	OCPP interface, Chargesight
Temperature range	-4 to 104 °F
Operational noise level	< 55 dB(A) @ 40"
System weight	270 lbs
Protection	NEMA 3R
Environment operating	ISO 12944: C4 H
Dimensions	H: 36" W: 20" D: 20"

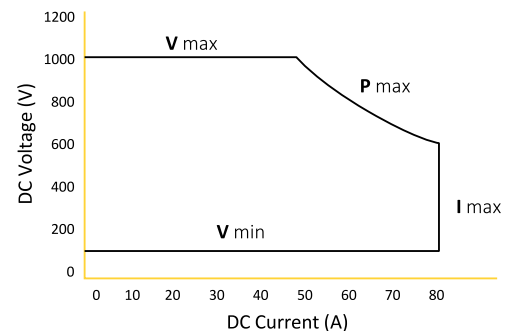
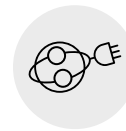
## Input

Input connections	3P + G
Input power rating; full load / idle	54 kVA / 15 VA
Input line-line voltage range	480 V AC +/- 10 %, 60 Hz
Input maximum AC current per phase	65 A, inrush current limited

## Output

Output DC voltage range	100 - 1000 V
Rated DC output power	50 kW
Maximum DC output current	80 A

## Interfaces



heliox

[www.heliox-energy.com](http://www.heliox-energy.com)

[info@heliox-energy.com](mailto:info@heliox-energy.com)