

# IVORY HOMES

**Holbrook Farms  
Development**

**High Level Electrical  
Master Plan**

**September 2015**

**Intermountain Consumer  
Professional Engineers, Inc.**  
1145 East South Union Avenue  
Midvale, Utah 84047



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## IVORY HOMES – HOLBROOK FARMS DEVELOPMENT

### High Level Electrical Master Plan

#### PURPOSE

The purpose of this report is to develop an estimate of the load that can be expected for the proposed Ivory Homes Holbrook Farms development. Also included is a preliminary recommended location of a new substation and the associated main trunk feeders that will be required to serve the development. The information provided is based on the current Land Use Plan and information obtained from discussions with Lehi City.

#### LOAD ESTIMATES

Load estimates were based on the unit counts and densities shown on the Land Use Plan dated 8/11/15. A copy is included with this report. Additional information was also obtained with a meeting at Ivory Homes offices on 8/19/15. The location of apartments, townhomes, and single family dwellings were identified. The general types of uses for the commercial and office areas were also identified.

Typical unit loads (kW/unit) were used for the various load types. For larger office buildings and commercial loads, information from Lehi City was used. Loads for each development area were developed. Table 1 provides a summary of the anticipated load level for each area as well as the overall development. It should be noted that two load levels are identified. The first is for the "Less Dense" unit counts indicated on the land use plan and the second is for the "More Dense" unit counts. As can be seen a load range of between 20 MW and 31 MW can be expected for the complete development of the area. Tables 1-A and 1-B provide additional details for some of the areas. It should be noted that loads were estimated for the three areas not in the Holbrook Farms development (identified as A, B, and C) since they would be served from the same distribution system.

The estimated loads are general in nature and are to be used for initial planning purposes only. As additional plans and details become available the load levels in each area should be reevaluated. Loads may be higher or lower than what is indicated based on the final building types that are constructed.

Area 1 (Flex Area) is a large tract of land but has the most uncertainty as to the type and timing of potential development. This is primarily due to the planned freeway that would cross this area. Loads should be reviewed when plans become more clear as to the number and type of units to be developed.

#### EXISTING LEHI AND RMP ELECTRICAL FACILITIES

RMP has two double circuit transmission lines that cross through the development, just west of 3600 West. The line on the west is a double circuit 345 kV line, and the line on the east is a double circuit 138 kV line.

The southern boundary of the development area is along 2100 North road. Lehi City has recently installed a new double circuit 12.47 kV distribution line which runs along the north side of 2100 North. The conductor for the circuits is 477 ACSR. The two circuits connect to the existing Lehi City distribution system just east of the Jordan River on 2100 North.

At the present time load on the two distribution circuits is minimal, however the circuits they are connected to are fed from the heavily loaded Thanksgiving Point area distribution system. Lehi City has indicated that the Thanksgiving Point area circuits are at their design capacity. As such little if any additional load can be supplied from the Thanksgiving Point area to feed the new Holbrook Farms development.



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## REQUIRED FACILITY ADDITIONS

### *Substation*

With the above in mind a new substation will be required to serve the development. A substation site will need to be selected and agreed on with Lehi City as soon as practical to be able to support the development needs. The suggested location of the new substation is in Area 13 to the east of the existing Rocky Mountain Power (RMP) 138 kV double circuit transmission line and as near to 2100 North as practical. If a suitable site adjacent to the RMP ROW can be agreed on it will minimize impact to the development as well as minimize new facilities that would need to be installed by Lehi City. This area is planned commercial and is already impacted by the RMP transmission lines and 2100 North.

The preferred location of the substation is on the east side of the RMP lines. The substation would be connected to one of the circuits on the 138 kV (east) RMP line. It may be possible to locate the substation to the west of the RMP lines; however, this would require crossing under the 345 kV lines with a 138 kV tap line. It will be very difficult to maintain the required clearances between the lines and to get approval from RMP for such a crossing. Lehi City was required to place the double circuit distribution line underground for the crossing of these lines.

The substation would be configured as a two bay (transformer) substation with a capability to have 6 to 8 distribution circuits feeding from the substation. A configuration similar to the recently completed Littlefield substation could be anticipated for this location. The final configuration and space requirements of the substation will also be dependent on the requirements that RMP may have to interconnect at this location on their system.

### *Distribution Circuits*

The existing double circuit distribution line can be configured to create 4 distribution main circuits from the new substation. Using the existing riser points on either side of the RMP ROW's, two circuits can be created to the east and two to the west of the proposed substation site. These circuits will be used to serve both future and existing loads in the area. The circuits to the east will also provide backup to the existing City loads. Two new underground circuits are also anticipated to be installed to serve the central portion of the development.

Drawings E100, E101 and E102 show the proposed main feeder or "backbone" circuits that would be required to serve the Holbrook Farms development. It is assumed that main circuits indicated would be 600 A, 12.47Y/7.2 kV feeders. The layout provides for tie points between the various circuits to allow for contingency or maintenance circuit configurations. Table 2 is a load estimate by circuit and development area. Four to six distribution circuits are planned to serve the Holbrook Farms area.

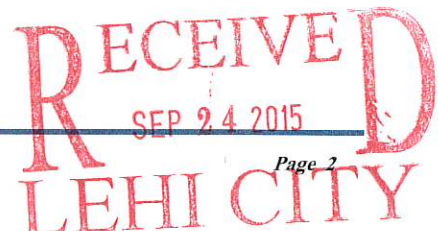
Additional internal single and three phase feeders will be required within each development area. The design for these areas would be determined as part of the detailed development and plat approval process.

## TIMING OF REQUIRED IMPROVEMENTS

It has been indicated that the land along 3600 West would be the first ones to be developed. Homes in areas 12 and 16 would begin in the first year of development. The commercial areas of 14 and 15 are planned in the second year. Beyond the first two years it is uncertain at this point in time which areas would be developed next. The economy and the demand for various types of development will determine the development sequence.

As can be seen from the drawings and Table 2 the initial areas to be developed are planned to be served from Circuit 3 on the maps. Since there are no existing facilities in the area, portions of Circuits 2 and/or 4 would also need to be installed to provide backup capability to the new load. Close coordination with Lehi will be required as the development progresses to assure the proper level of service is maintained to the customers.

As has been previously discussed above there is little if any capacity in the circuits which currently feed the double circuit line which runs along 2100 North. As such the substation will need to be completed as soon as practical to serve the new development. The substation will take will typically take 12-18 months to complete and put into service. In the interim Lehi may be willing to serve a small amount of load from the double circuit line.



**IVORY HOMES  
HOLBROOK FARMS DEVELOPMENT**

*High Level Electrical Master Plan*

**SUMMARY**

The estimated load for the new Holbrook Farms development will be between 20 MW and 30 MW depending on final densities and building types served. While there is a main double circuit overhead line on the south side of the development area, the existing circuits from the Thanksgiving Point area are at capacity. As such a new substation will be required to be constructed as soon as development is started. Four to six distribution circuits will be required to meet the load demands of the development.



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**TABLE 1**

**HOLBROOK FARMS**  
Electrical Load Estimate

Area	Description	Type/Notes	Acres	Less Dense Plan			More Dense Plan		
				Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Density	Est. # of Units	Est. Avg. kW/Unit
1	Flex Zone	Varies (1)	192.62		633	4.120		1,103	7,290
2	Commercial/Office		7.29	0.3	2	75.0	150	4	300
3	Residential Area	HD/Apartment	11.48	25.0	287	5.5	1,580	402	2,210
4	Commercial/Office	Schools (1)	28.82		2		800	2	800
5	Commercial/Office		6.19	0.3	2	75.0	150	3	230
6	Residential Area	Townhouse	24.41	8.0	195	6.0	1,170	293	1,760
7	Residential Area	Mixed	29.37	8.0	235	6.5	1,530	352	2,290
8	Residential Area	Single (6,000' Lots)	11.98	5.0	60	6.5	390	96	620
9	Residential Area	Single (6,000' Lots)	30.57	4.0	122	6.5	790	183	1,190
10	Open Space - Park		34.80				0		0
11	Residential Area	Single (6,000' Lots)	39.85	4.0	159	6.5	1,030	239	1,550
12	Residential Area	Single (9,000' Lots)	34.38	2.4	83	7.0	580	120	840
13	Commercial/Office	Office/C-Store (1)	17.97		6		500	9	725
14	Commercial/Office	Grocery (1)	11.86		2		400	3	450
15	Commercial/Office	Big Box & Pads (1)	16.82		3		550	4	625
16	Residential Area	Single (10,000' Lots)	102.69	2.0	205	7.5	1,540	359	2,690
17	Commercial/Office	Multi-Story Offices	39.20	0.15	6	500.0	3,000	10	5,000
18	Residential Area	Single (Cluster/5,000' lots)	23.20	5.0	116	6.0	700	186	1,120
19	Open Space - Park		28.25				0		0
TOTALS			691.75		2,118		18,980	3,368	29,690

TOTALS without Area 1

499.13

1,485

14,860

2,265

22,400

(1) See Area Summary for More Details

**Areas Not Part of Holbrook Farms**  
Electrical Load Estimate

Area	Description	Type/Notes	Acres	Less Dense Plan			More Dense Plan		
				Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Density	Est. # of Units	Est. Avg. kW/Unit
A	Commercial/Office		15.44	0.3	5	75.0	380	8	600
B	Residential Area	Single (6,000' Lots)	18.06	4.0	72	6.5	470	108	700
C	Commercial/Office		6.62	0.3	2	75.0	150	3	230
TOTALS			40.12		79		1,000	119	1,530

TOTAL ALL AREAS

731.87

2,197

19,980

3,487

31,220



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**TABLE 1-A**

**Flex Area Estimate**

Area 1 Acres	Description	Type/Notes	Acres	Less Dense Plan			More Dense Plan					
				Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	
192.62												
East of UDOT	Commercial Apartment Townhouse	Assumed 10% of Total	19.00	0.3	6	100.0	600	0.3	6	100.0	600	
		Assumed 10% of Total	19.00	25.0	475	5.5	2,610	35.0	665	5.5	3,660	
		Assumed 10% of Total	19.00	8.0	152	6.0	910	12.0	228	6.0	1,370	
West of UDOT	Office Townhouse Single	Assumed 10% of Total	19.00	0.0	0	75.0	0	0.3	6	75.0	450	
		Assumed 10% of Total	19.00	0.0	0	6.0	0	8.0	152	6.0	910	
		Assumed 10% of Total	19.00	0.0	0	6.5	0	2.4	46	6.5	300	
UDOT	UDOT Corridor	Balance	78.62				0				0	
<b>TOTALS</b>			192.62		633		4,120		1,103		7,290	



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**TABLE 1-B**

**Commerical Area Estimates**

Area 4 Acres		28.82			Less Dense Plan				More Dense Plan					
Description	Type/Notes	Acres	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)
A Junior High School		20.00		1	500.0	500		1	500.0	500		1	500.0	500
B Elementary School		8.82		1	300.0	300		1	300.0	300		1	300.0	300
<b>TOTALS</b>		<b>28.82</b>		<b>2</b>		<b>800</b>		<b>2</b>		<b>800</b>		<b>2</b>		<b>800</b>

Area 13 Acres		17.97			Less Dense Plan				More Dense Plan					
Description	Type/Notes	Acres	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)
A Substation Site		2.00		1	50.0	50		1	50.0	50		1	50.0	50
B Convenience Store		1.75		1	150.0	150		1	150.0	150		1	150.0	150
C Office		14.22	0.3	4	75.0	300		7	75.0	525	0.5	7	75.0	525
<b>TOTALS</b>		<b>17.97</b>		<b>6</b>		<b>500</b>		<b>9</b>		<b>725</b>		<b>9</b>		<b>725</b>

Area 14 Acres		11.86			Less Dense Plan				More Dense Plan					
Description	Type/Notes	Acres	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)
A Grocery Pad		10.00		1	350.0	350		1	350.0	350		1	350.0	350
B		1.86		1	50.0	50		2	50.0	100		2	50.0	100
<b>TOTALS</b>		<b>11.86</b>		<b>2</b>		<b>400</b>		<b>3</b>		<b>450</b>		<b>3</b>		<b>450</b>

Area 15 Acres		16.82			Less Dense Plan				More Dense Plan					
Description	Type/Notes	Acres	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)	Est. Density	Est. # of Units	Est. Avg. kW/Unit	Est. Load (kW)
A Big Box Pads		10.00		1	400.0	400		1	400.0	400		1	400.0	400
B		6.82	0.3	2	75.0	150		3	75.0	225	0.5	3	75.0	225
<b>TOTALS</b>		<b>16.82</b>		<b>3</b>		<b>550</b>		<b>4</b>		<b>625</b>		<b>4</b>		<b>625</b>



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**TABLE 2**  
Estimated Circuit Loadings (kW)

Circuit 1 - West Existing OVHD & New URD

Area	Less Dense	More Dense
1	4,120	7,290
2	150	300
3	1,580	2,210
4	800	800
<b>Total</b>	<b>6,650</b>	<b>10,600</b>

Circuit 2 - Northwest New URD

Area	Less Dense	More Dense
A	380	600
5	150	230
6	1,170	1,760
7	1,530	2,290
8	390	620
9	790	1,190
<b>Total</b>	<b>4,410</b>	<b>6,690</b>

Circuit 3 - North (Central) New URD

Area	Less Dense	More Dense
B	470	700
C	150	230
11	1,030	1,550
12	580	840
13	500	725
14	400	450
15	550	625
16	1,540	2,690
<b>Total</b>	<b>5,220</b>	<b>7,810</b>

Circuit 4 - East Existing OVHD & New URD

Area	Less Dense	More Dense
17	3,000	5,000
18	700	1,120
<b>Total</b>	<b>3,700</b>	<b>6,120</b>

Circuits 5 - Existing OVHD to West

Area 1 if required &  
new growth to the south.

Circuit 6 - Existing OVHD to East

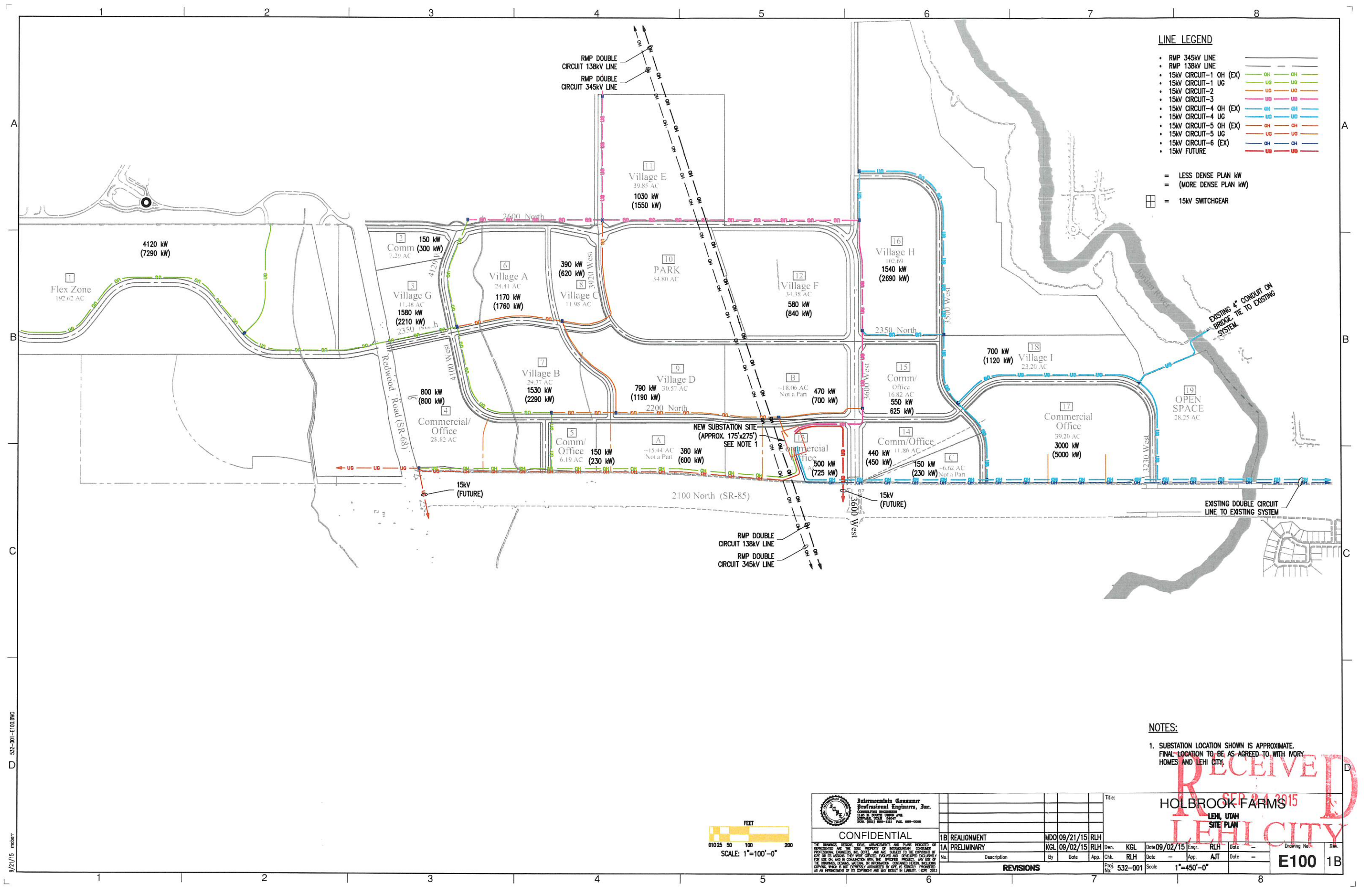
Tie to existing system &  
new growth to the south.



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Drawings

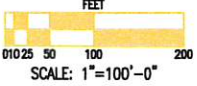
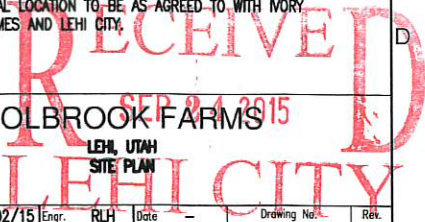


**LINE LEGEND**

- RMP 345kV LINE
- RMP 138kV LINE
- 15kV CIRCUIT-1 OH (EX)
- 15kV CIRCUIT-1 UG
- 15kV CIRCUIT-2
- 15kV CIRCUIT-3
- 15kV CIRCUIT-4 OH (EX)
- 15kV CIRCUIT-4 UG
- 15kV CIRCUIT-5 OH (EX)
- 15kV CIRCUIT-5 UG
- 15kV CIRCUIT-6 (EX)
- 15kV CIRCUIT-6 (OH)
- 15kV CIRCUIT-6 (UG)
- 15kV FUTURE

= LESS DENSE PLAN KW  
 = (MORE DENSE PLAN KW)  
 □ = 15kV SWITCHGEAR

**NOTES:**  
 1. SUBSTATION LOCATION SHOWN IS APPROXIMATE. FINAL LOCATION TO BE AS AGREED TO WITH IVORY HOMES AND LEHI CITY.

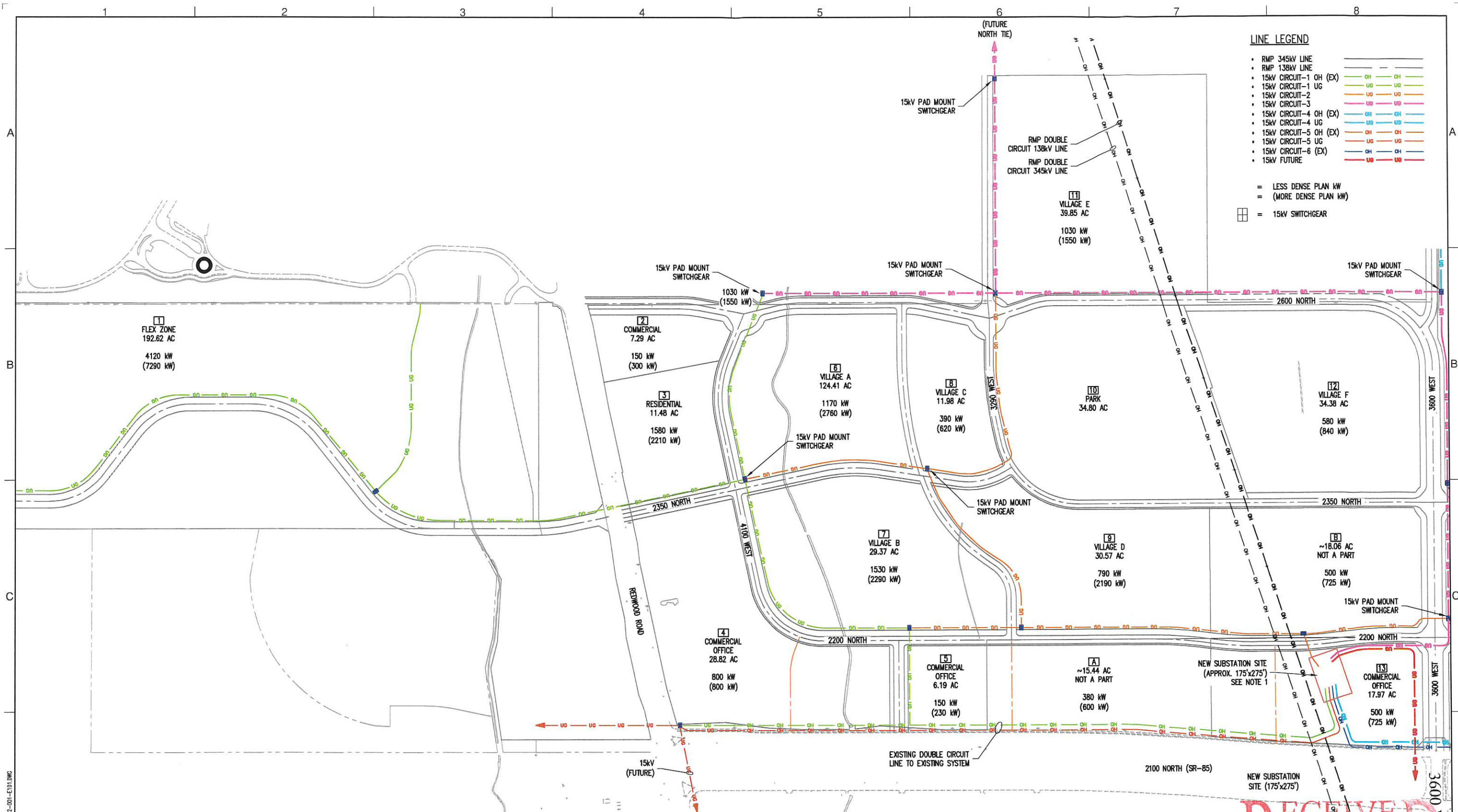


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Title: <b>HOLBROOK FARMS LEHI, UTAH SITE PLAN</b>		
<b>1B REALIGNMENT</b>	<b>MDO 09/21/15</b>	<b>RLH</b>
<b>1A PRELIMINARY</b>	<b>KGL 09/02/15</b>	<b>RLH</b>
Dwn. KGL Date 09/02/15 Engr. RLH Date - Chk. RLH Date - App. AJT Date - Proj. No: 532-001 Scale 1"=450'-0" Drawing No: <b>E100</b> Rev. <b>1B</b>		

9/21/15 mbarr 532-001-E100.DWG



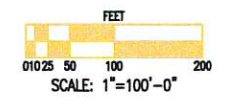
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- 15KV CIRCUIT-4 UG
- 15KV CIRCUIT-5 OH (EX)
- 15KV CIRCUIT-5 UG
- 15KV CIRCUIT-6 (EX)
- 15KV CIRCUIT-6 UG
- 15KV CIRCUIT-6 OH (EX)
- 15KV CIRCUIT-6 UG
- 15KV CIRCUIT-6 OH
- 15KV CIRCUIT-6 UG
- 15KV CIRCUIT-6 OH
- 15KV CIRCUIT-6 UG

= LESS DENSE PLAN KW  
 = (MORE DENSE PLAN KW)  
 □ = 15KV SWITCHGEAR

**NOTES:**

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1B REALIGNMENT	MDO 09/21/15 RLH	Dwn.	KGL
1A PRELIMINARY	KGL 09/02/15 RLH	Date	09/02/15
Description		Engr.	RLH
By		Date	-
App.		App.	AJT
Date		Date	-
<b>REVISIONS</b>			
Proj No:		Scale:	1"=250'-0"
532-001			
Drawing No. <b>E101</b>		Rev. <b>1B</b>	

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HOLBROOK FARMS

LEHI, UTAH

PARTIAL SITE PLAN

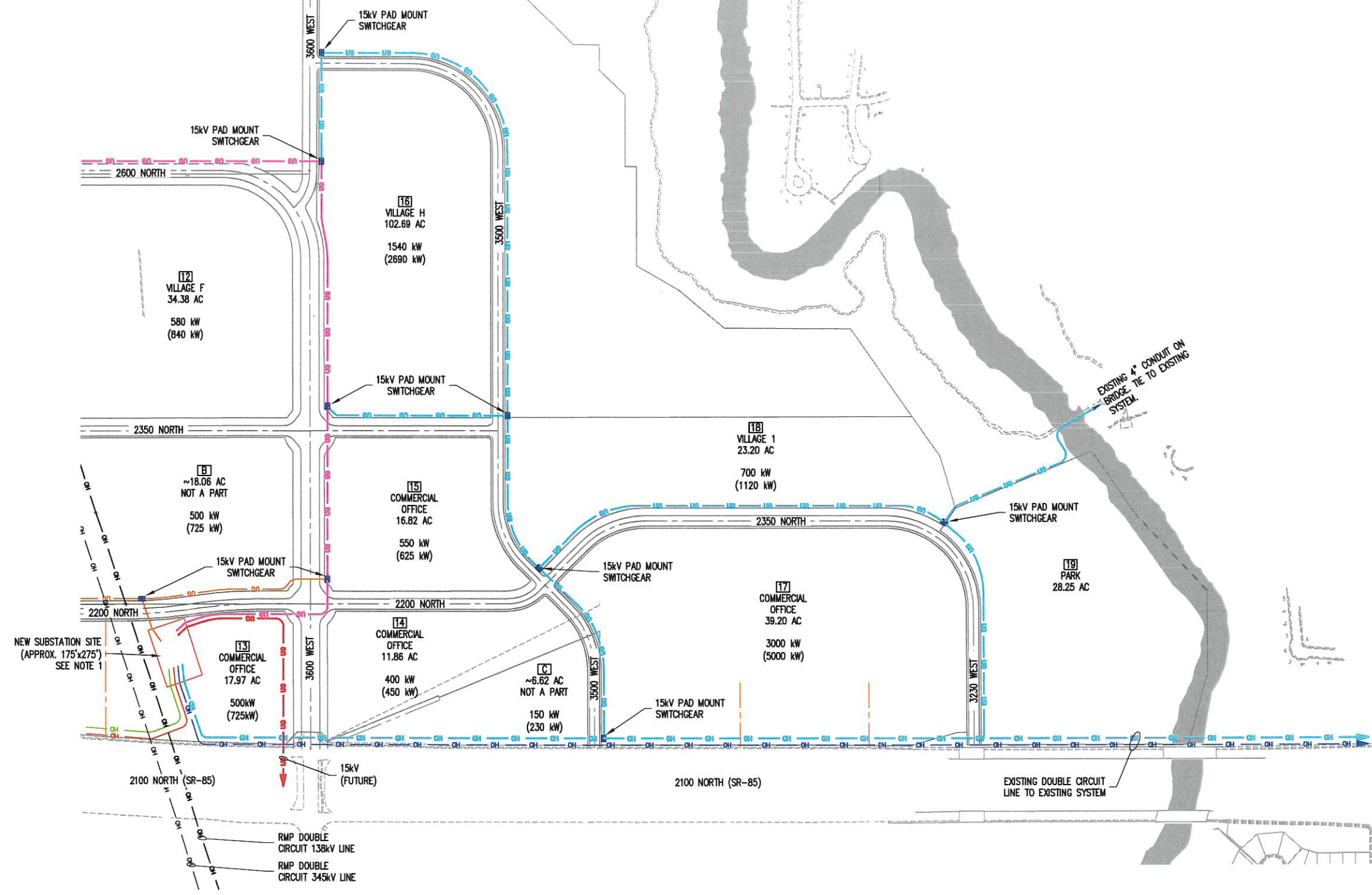
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9/21/15 mcbarr

**LINE LEGEND**

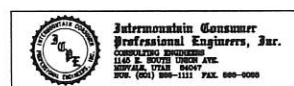
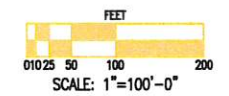
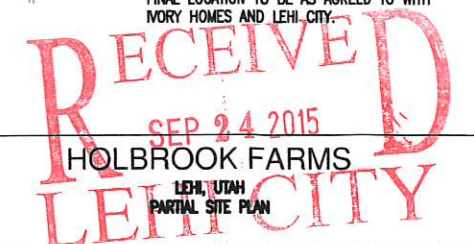
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- 15KV CIRCUIT-4 UG
- 15KV CIRCUIT-5 OH (EX)
- 15KV CIRCUIT-5 UG
- 15KV CIRCUIT-6 (EX)
- 15KV FUTURE

- = LESS DENSE PLAN KW
- = (MORE DENSE PLAN KW)
- ☐ = 15KV SWITCHGEAR



**NOTES:**

1. SUBSTATION LOCATION SHOWN IS APPROXIMATE. FINAL LOCATION TO BE AS AGREED TO WITH WOVRY HOMES AND LEHI CITY.



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1B REALIGNMENT		WDO	09/21/15	RLH					
1A PRELIMINARY		KGL	09/02/15	RLH					
REVISIONS									
Title:									
Dwn:		KGL		Date: 09/02/15		Engr: RLH		Date: -	
App:		AJT		Date: -		App: RLH		Date: -	
Proj No: 532-001		Scale: 1"=225'-0"		Drawing No: E102		Rev: 1B			

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