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Horizon Center Estimates

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CCI Project No. 00975-0002

STATE OF TENNESSEE
COMMERCE
No. 23035

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Cannon&Cannon,Inc.
Consulting Engineers • Field Surveyors

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The City of Oak Ridge Electric Department currently provides electric service to the Horizon Center, an Industrial Park located on SR58 on former DOE property within the Oak Ridge city limits. The Horizon Center was originally designed for office space with an anticipated maximum electrical load of 10 Megawatts.

The use of the site has changed since the original electrical infrastructure was designed and constructed. These changes have resulted in increased electrical usage for the park. With approximately 23 percent of the available site areas committed to, the electrical commitments have exceeded the 10 Megawatt design capacity.

There is a significant percentage of available building site area available and the possibility of industries with large electrical loads desiring to locate here. Various industries have been proposed for the park, some of which may have electrical requirements as high as 60 Megawatts and also the potential for dual electrical feed requirements.

Cannon & Cannon, Inc. (CCI) was retained by the City of Oak Ridge Electric Department (CORED) to perform an analysis of available options to provide for the electrical requirements of Horizon Center. CCI was charged with providing CORED a report containing conceptual designs with estimates for providing additional electrical capacity to the park. In addition, CCI was to provide guidance as to estimated electrical loadings for the non-committed building sites.

The Horizon Center is an industrial park located on former Department of Energy property on SR58 within the city limits of Oak Ridge, Tennessee. This industrial park was originally designed to accommodate office space with a small number of educational and other uses that would have limited electrical requirements.

The Community Reuse Organization of East Tennessee (CROET) installed an electric infrastructure to accommodate the intended usage. The anticipated use of the park has since evolved since its inception, and larger industries have been proposed for the parks available building sites. Some of these proposed industries may have electrical requirements that exceed the capacity of the existing electrical infrastructure.

After internal discussions, CORED met with Cannon & Cannon, Inc. (CCI) to investigate the available options to provide for the electrical requirements of the Horizon Center industrial park. With the wide range of possible industries expressing an interest in locating at the park, CCI has developed guidelines as to the estimated electrical loadings for the non-committed building sites.

CCI has also developed a wide range of conceptual designs and their estimated construction costs for use in determining the most flexible and economical way to provide for the electrical needs of industries that may locate in Horizon Center. These options include ways to reinforce the existing infrastructure as well as to account for reasonable future growth. In order to make recommendations, three different scenarios were analyzed in this report.

The existing electrical infrastructure that is in place along the southwest portion of the park serves the existing industries and building sites that have been committed to. Installed capacity and committed capacity does not necessarily equate to actual used capacity, CCI recommends that the loading of the existing line sections be monitored, and that they be upgraded when the actual loads reach 80 percent of capacity. These upgrades can be performed in phases with estimated costs ranging from $460,000 to $1,250,000.

The three remaining large sites, identified as Development Areas 5, 6, and 7 have the largest potential for industries with large electrical loads. With no commitments for these development areas, CCI has prepared our recommendations based on estimated loads, while remaining flexible in the design and construction in order to accommodate future requirements.

CORED already has in place an easement that runs from Substation 900 along the northwest side of the park to the corner of Development Area 5. CCI recommends that CORED pursue obtaining additional right-of-way that would extend this easement to Development Areas 6

and 7. Until right-of-way has been established, the exact nature and routing of facilities to serve these areas is unknown.

CCI is therefore recommending a phased approach to providing electrical service to these three development areas. For Phase 1, CCI recommends that initially a single 13 kV overhead power line be constructed using the existing electrical easement to Development Area 5. This line should be designed to be able to upgraded in the future as electrical loadings increase.

As CORED is able to secure the necessary easements, CCI recommends that this power line be extended to Development Area 6 in Phase 2, and Development Area 7 in Phase3, again using a design that allows for upgrading. A single circuit 13 kV power line should be constructed to these development areas.

CCI recommends this phased overhead approach as the most flexible and economical method of providing an initial electric infrastructure to the three undeveloped areas of Horizon Park. For an investment of between $1,550,000 and $1,650,000 an initial capacity of 14.22 MW would be available. This approach would allow for an economic expansion to 42.66 MW or more if additional capacity is required.

CCI has estimated several underground options for reference, however due to the nature of an underground system sufficient to serve the projected electrical loads, we do not recommend that an underground electric infrastructure to be installed. Should commitments be made by industries on these undeveloped sites, and sufficient load information be available to allow for a proper underground design to be made, we would be happy to revisit an underground alternative.

OVERVIEW

The scope of this work is to investigate the available options to provide for the current and future electrical requirements of the Horizon Center industrial park. The park is located on SR58, between CORED substations 900 and 100. Substation 100 is located approximately four miles east of the site, and substation 900 is located approximately a mile to the west. This is shown as Exhibit 1.

Due to the varying nature of possible commercial and industrial businesses that may locate here, it is difficult to predict exact future electrical loadings. Estimated electrical loadings have therefore been developed for each undeveloped building site based on the location of the park, the individual lot size and shape, and comparable industrial sites in the region. These estimated loadings are shown in Appendix A.

The existing and projected loadings for the park are 13.3 MVA. Of this, 5 MVA is at Carbon Fiber, and 5 MVA is at Theragenics, the remaining 3.3 MVA is spread out among an additional seven sites as shown on Exhibit 2. Of this load, 9 MVA has been installed, with the remainder to be installed at a future date. These loadings are shown in Appendix B.

From information obtained from CORED, the existing electrical infrastructure, shows that the industrial park is currently served from substation 900 using feeder 95. This circuit begins as a 795 AAC overhead circuit, changing to a 336 ACSR overhead circuit, and then to a parallel 350 copper UG circuit, arriving at a set of switchgear located on Palladium Way at the corner of the Carbon Fiber property. From this switchgear, separate underground lines branch out to serve the Carbon Fiber and Theragenics sites. A third 4/0 copper underground circuit runs along Palladium Way to Novus Drive, then northwest to Renovare Blvd, and continues northeast along Renovare Blvd to the cell tower site at 200 Renovare Blvd. This is shown as Exhibit 2.

The 795 AAC overhead feeder has a capacity of 14.22 MW which is adequate for the committed electrical loads. However the 336 ACSR overhead and the parallel 350 copper underground sections have capacities of 8.41 MW and 10.71 MW, respectively. Conductor capacities are shown in Appendix C.

There is currently no electrical service to Development Area 5, and the capacity available to Development Areas 6 and 7 is limited.

This report does not address any environmental or conflicting use issues, but does account for known restrictions as to access and construction methods in the estimated construction costs.

For the purposes of this discussion, the project is broken down into options to upgrade and reinforce the existing infrastructure, options to provide adequate electric capacity to the unimproved available building sites, and options to provide large capacity or dual feeds to the unimproved available building sites. Options to provide large capacity are at 69 kV.

UPGRADE AND REINFORCE EXISTING INFRASTRUCTURE OPTIONS:

- **Option A:** Replace (Reconductor) the existing 336 ACSR overhead conductor with 795 AAC conductor
- **Option B:** Add a second circuit to the existing 336 ACSR overhead portion
- **Option C:** Reconductor the existing 336 ACSR overhead portion to 795 AAC and increase the underground capacity to match.
- **Option D:** Add a second circuit to the existing 336 ACSR overhead portion and add additional underground capacity to match the new overhead conductor.

OPTIONS TO PROVIDE ADEQUATE ELECTRICAL CAPACITY TO THE UNIMPROVED AVAILABLE BUILDING SITES:

- **Option E:** Provide capacity for Development Areas 5 and 6 from Substation 900 overhead with future 69 kV to Development Area 6
- **Option F:** Provide capacity for Development Areas 5 and 6 from Substation 900 overhead to Development Area 5 and underground to Development Area 6 with future 69 kV to Development Area 5
- **Option G:** Provide capacity for Development Areas 5, 6 and 7 from Substation 900 overhead with future 69 kV to Development Area 6
- **Option H:** Provide capacity for Development Areas 5, 6 and 7 from Substation 900 overhead to Development Area 6 and underground to Development Area 7, with future 69 kV to Development Area 6
- **Option I:** Provide capacity for Development Areas 5, 6 and 7 from Substation 900 overhead to Development Area 5 and underground to Development Areas 6 and 7, with future 69 kV to Development Area 5
- **Option J:** Provide capacity for Development Areas 5, 6 and 7 from Substation 900 Underground with no provisions for future 69 kV
- **Option K:** Provide capacity for Development Area 7 from Substation 100 overhead
- **Option L:** Provide capacity for Development Area 7 from Substation 100 overhead to Imperium Drive and underground to the site.

OPTIONS TO PROVIDE LARGE CAPACITY OR DUAL FEEDS TO THE UNIMPROVED AVAILABLE BUILDING SITES:

- **Option M:** Provide 13 kV dual feed capacity for Development Areas 5 or 6 overhead
- **Option N:** Provide 13kV dual feed capacity for Development Areas 5 or 6 overhead/underground
- **Option O:** Provide large capacity 69 kV for Development Area 5 from Substation 900 overhead
- **Option P:** Provide large capacity 69 kV for Development Area 6 from Substation 900 overhead
- **Option Q:** Provide large capacity 69 kV for Development Area 6 from Substation 900 overhead to Development Area 5 and underground to Development Area 6
- **Option R:** Provide dual feed large capacity 69 kV for Development Areas 5 or 6 overhead
- **Option S:** Provide dual feed large capacity 69 kV for Development Areas 5 or 6 overhead/underground

There are currently no electrical commitments for Development Areas 5, 6 or 7. Therefore, for purposes of discussion, the following scenarios of development were assumed:

- **Scenario A:** Industrial developments of 9.5 MW on Development Area 5, 15 MW on Development Area 6, and 7.5 MW on Development Area 7.
- **Scenario B:** A large data center requiring 60 MW and a dual feed on Development Area 5, 30 MW on Development Area 6, and 15 MW on Development Area 7.
- **Scenario C:** Heavy industrial developments of 20 MW on Development Area 5, 30 MW on Development Area 6, and 15 MW on Development Area 7.

The upgrade and reinforce existing infrastructure options that have been identified and will be discussed here are:

OPTION A: REPLACE (RECONDUCTOR) THE EXISTING 336 ACSR OVERHEAD CONDUCTOR WITH 795 AAC CONDUCTOR

Option "A" consists of reconductoring approximately 6000 feet of existing single circuit 336 ACSR to 795 AAC.

Feeder 95 which serves existing loads in Horizon Park begins as a 795 AAC overhead feeder which has a capacity of 14.22 MW. However, it changes to a 336 ACSR overhead line which has a capacity of 8.41 MW before changing to a parallel 350 copper underground line with a capacity of 10.71 MW.

Currently, the existing capacity is controlled by the capacity of the 336 conductor. Reconductoring this section of line (approximately 6000 feet) to 795 AAC would increase the overall capacity to the Park by 2.3 MW to 10.71 MW. This option has the advantage of possibly being able to utilize a portion of the existing poles which would reduce the overall cost.

The estimated cost to reconductor the 6,000 feet of line is $ 460,000.

OPTION B: ADD A SECOND CIRCUIT TO THE EXISTING 336 ACSR OVERHEAD PORTION

Option "B" consists of adding a second circuit of 795 AAC conductor to the line section of 336 ACSR, approximately 6000 feet.

Feeder 95 which serves existing loads in Horizon Park begins as a 795 AAC overhead feeder which has a capacity of 14.22 MW. However, it changes to a 336 ACSR overhead line which has a capacity of 8.41 MW before changing to a parallel 350 copper underground line with a capacity of 10.71 MW.

Currently, the existing capacity is controlled by the capacity of the 336 conductor. Adding a second circuit of 795 AAC conductor tied to feeder 96 would increase the overall capacity to the Park by 2.3 MW to 10.71 MW.

The estimated cost to double circuit the 6,000 feet of line is $ 650,000.

OPTION C: RECONDUCTOR THE EXISTING 336 ACSR OVERHEAD PORTION TO 795 AAC AND INCREASE THE UNDERGROUND CAPACITY TO MATCH

Option "C" consists of reconductoring approximately 6,000 feet of existing single circuit 336 ACSR to 795 AAC, and to increase the underground capacity to match the capacity of the overhead conductor.

Feeder 95 which serves existing loads in Horizon Park begins as a 795 AAC overhead feeder which has a capacity of 14.22 MW. However, it changes to a 336 ACSR overhead line which has a capacity of 8.41 MW before changing to a parallel 350 copper underground line with a capacity of 10.71 MW.

Currently, the existing capacity is controlled by the capacity of the 336 conductor. Reconductoring this section of line, approximately 6000 feet, to 795 AAC would increase the overall capacity to the park by 2.3 MW to 10.71 MW.

In order to increase the underground conductor capacity to match the overhead conductor capacity, a third 350 copper underground line would need to be added. Adding a third set of underground conductors would increase the overall capacity to 14.21 MW.

This option has the advantage of possibly being able to utilize a portion of the existing poles which would reduce the overall cost. Also adding the third 350 copper circuit would allow it to be tied into the existing 4/0 copper underground circuit which feeds from the switchgear located at the corner of the Carbon Fiber property. The existing parallel underground circuit could be used to feed the existing Carbon Fiber and Theragenics sites, while the new underground circuit could be used to feed the remainder of the existing and committed loads.

The estimated cost to reconductor the 6,000 feet of overhead line and to add the additional 1650 feet of underground is $ 720,000.

OPTION D: ADD A SECOND CIRCUIT TO THE EXISTING 336 ACSR OVERHEAD PORTION AND ADD ADDITIONAL UNDERGROUND CAPACITY TO MATCH THE NEW OVERHEAD CONDUCTOR

Option "D" consists of adding a second circuit of 795 AAC conductor to the line section of 336 ACSR, approximately 6,000 feet and to increase the underground capacity to match the capacity of the overhead conductor.

Feeder 95 which serves existing loads in Horizon Park begins as a 795 AAC overhead feeder which has a capacity of 14.22 MW. However, it changes to a 336 ACSR overhead line which has a capacity of 8.41 MW before changing to a parallel 350 copper underground line with a capacity of 10.71 MW.

Currently, the existing capacity is controlled by the capacity of the 336 conductor. Adding a second circuit of 795 AAC conductor tied to feeder 96, would increase the overall capacity to the park by 2.3 MW to 10.71 MW.

In order to fully utilize the new 795 AAC circuit, underground conductor capacity to match the overhead conductor capacity would need to be added. A parallel 750 copper underground line would increase the capacity to the park by 14.22 MW.

This would increase the overall capacity available at the switchgear located at the corner of the Carbon Fiber property from 8.41 MW to 22.63 MW.

The estimated cost to double circuit the 6,000 feet of line and to add the additional 1,650 feet of parallel underground is $ 1,250,000.

The options to provide adequate electrical capacity to the unimproved available building sites:

OPTION E: PROVIDE CAPACITY FOR DEVELOPMENT AREAS 5 AND 6 FROM SUBSTATION 900 OVERHEAD WITH FUTURE 69 KV TO DEVELOPMENT AREA 6

Option "E" consists of constructing approximately 3,900 feet of new double circuit 795 AAC overhead power line from Substation 900 to Development Area 5, and another 1,900 feet or 3,300 feet of single circuit 795 AAC overhead power line to Development Area 6. This line is to be designed for a future 69 kV circuit. This route is shown on Exhibit 3.

Development Area 5 is estimated to have approximately a 9.5 MW electrical load, and Development Area 6 is estimated to have approximately a 15 MW electrical load.

This option will provide 14.22 MW of capacity available at Development Area 5, and 14.22 MW available at Development Area 6, for a total of 28.44 MW capacity.

The estimated cost to construct the approximately 5,800 feet of overhead line is $ 1,120,000. For the longer route of approximately 7,200 feet our estimated cost is $ 1,200,000.

OPTION F: PROVIDE CAPACITY FOR DEVELOPMENT AREAS 5 AND 6 FROM SUBSTATION 900 OVERHEAD TO DEVELOPMENT AREA 5 AND UNDERGROUND TO DEVELOPMENT AREA 6 WITH FUTURE 69 KV TO DEVELOPMENT AREA 5

Option "F" consists of constructing approximately 3,900 feet of new double circuit 795 AAC overhead power line from Substation 900 to Development Area 5, and another 1,900 feet or 3,300 feet of parallel 750 copper underground power line to Development Area 6. The overhead portion of the line is to be designed for a future 69 kV circuit. This route is shown on Exhibit 4.

Development Area 5 is estimated to have approximately a 9.5 MW electrical load, and Development Area 6 is estimated to have approximately a 15 MW electrical load.

This option will provide 14.22 MW of capacity available at Development Area 5, and 14.22 MW available at Development Area 6, for a total of 28.44 MW capacity.

The estimated cost to construct the approximately 3,900 feet of overhead line and 1,900 feet of underground line is $ 1,510,000. For the longer route of approximately 3,900 feet of overhead line and 3,300 feet of underground line our estimated cost is $ 1,960,000.

OPTION G: PROVIDE CAPACITY FOR DEVELOPMENT AREAS 5, 6 AND 7 FROM SUBSTATION 900 OVERHEAD WITH FUTURE 69 KV TO DEVELOPMENT AREA 6

Option "G" consists of constructing approximately 3,900 feet of new triple circuit 795 AAC overhead power line from Substation 900 to Development Area 5, 1,900 feet or 3,300 feet of new double circuit 795 AAC overhead power line to Development Area 6, and 6200 feet of new single circuit 795 AAC overhead power line to Development Area 7. The portion of line from Substation 900 to Development Area 6 is to be designed for a future 69 kV circuit. This route is shown on Exhibit 5.

Development Area 5 is estimated to have approximately a 9.5 MW electrical load, Development Area 6 is estimated to have approximately a 15 MW electrical load, and Development Area 7 is estimated to have approximately a 7.5 MW electrical load.

This option will provide 14.22 MW of capacity available at Development Area 5, 14.22 MW available at Development Area 6, and 14.22 MW of capacity available at Development Area 7 for a total of 42.66 MW capacity.

The estimated cost to construct the approximately 12,000 feet of overhead line $ 1,800,000. For the longer route of approximately 13,400 feet of overhead line our estimated cost is $ 2,000,000.

OPTION H: PROVIDE CAPACITY FOR DEVELOPMENT AREAS 5, 6 AND 7 FROM SUBSTATION 900 OVERHEAD TO DEVELOPMENT AREA 6 AND UNDERGROUND TO DEVELOPMENT AREA 7, WITH FUTURE 69 KV TO DEVELOPMENT AREA 6

Option "H" consists of constructing approximately 3,900 feet of new triple circuit 795 AAC overhead power line from Substation 900 to Development Area 5, 1,900 feet or 3,300 feet of new double circuit 795 AAC overhead power line to Development Area 6, and 6,200 feet of new single circuit 500 copper underground power line to Development Area 7. The portion of line from Substation 900 to Development Area 6 is to be designed for a future 69 kV circuit. This route is shown on Exhibit 6.

Development Area 5 is estimated to have approximately a 9.5 MW electrical load, Development Area 6 is estimated to have approximately a 15 MW electrical load, and Development Area 7 is estimated to have approximately a 7.5 MW electrical load.

This option will provide 14.22 MW of capacity available at Development Area 5, 14.22 MW available at Development Area 6, and 7.53 MW of capacity available at Development Area 7 for a total of 35.97 MW capacity.

The estimated cost to construct the approximately 5,800 feet of overhead line and 6200 feet of underground line is $ 2,400,000. For the longer route of approximately 7,200 feet of overhead line and 6200 feet of underground line our estimated cost is $ 2,600,000.

OPTION I: PROVIDE CAPACITY FOR DEVELOPMENT AREAS 5, 6 AND 7 FROM SUBSTATION 900 OVERHEAD TO DEVELOPMENT AREA 5 AND UNDERGROUND TO DEVELOPMENT AREAS 6 AND 7, WITH FUTURE 69 KV TO DEVELOPMENT AREA 5

Option "I" consists of constructing approximately 3,900 feet of new triple circuit 795 AAC overhead power line from Substation 900 to Development Area 5, 1,900 feet or 3,300 feet of new triple conductor 750 copper underground power line to Development Area 6, and 6,200 feet of new single circuit 500 copper underground power line to Development Area 7. The portion of line from Substation 900 to Development Area 5 is to be designed for a future 69 kV circuit. This route is shown on Exhibit 7.

Development Area 5 is estimated to have approximately a 9.5 MW electrical load, Development Area 6 is estimated to have approximately a 15 MW electrical load, and Development Area 7 is estimated to have approximately a 7.5 MW electrical load.

This option will provide 14.22 MW of capacity available at Development Area 5, 14.22 MW available at Development Area 6, and 7.53 MW of capacity available at Development Area 7 for a total of 35.97 MW capacity.

The estimated cost to construct the approximately 3,900 feet of overhead line and 8,100 feet of underground line is $ 3,050,000. For the longer route of approximately 3,900 feet of overhead line and 9,500 feet of underground line our estimated cost is $ 3,800,000.

OPTION J: PROVIDE CAPACITY FOR DEVELOPMENT AREAS 5, 6 AND 7 FROM SUBSTATION 900 UNDERGROUND WITH NO PROVISIONS FOR FUTURE 69 KV

Option "J" consists of constructing approximately 3,900 feet of four circuits of 1000 copper underground cable in a duct bank from Substation 900 to Development Area 5, 1,900 feet or 3,300 feet of three circuits of 750 copper underground cable in a duct bank to Development Area 6, and 6,200 feet of single circuit of 500 copper underground cable to Development Area 7. This route is shown on Exhibit 8.

Development Area 5 is estimated to have approximately a 9.5 MW electrical load, Development Area 6 is estimated to have approximately a 15 MW electrical load, and Development Area 7 is estimated to have approximately a 7.5 MW electrical load.

This option will provide 14.22 MW of capacity available at Development Area 5, 14.22 MW available at Development Area 6, and 7.53 MW of capacity available at Development Area 7 for a total of 35.97 MW capacity.

The estimated cost to construct the approximately 12,000 feet of underground line is $ 5,300,000. For the longer route of approximately 13,400 feet of underground line our estimated cost is $ 6,000,000.

OPTION K: PROVIDE CAPACITY FOR DEVELOPMENT AREA 7 FROM SUBSTATION 100 OVERHEAD

Option "K" consists of constructing approximately 6,100 feet of new single circuit 795 AAC overhead power line from the end of Feeder 11, Substation 100 along SR58 to Imperium Drive, approximately 1,000 feet of new single circuit 795 AAC overhead power line along Imperium Drive to Development Area 7. This route is shown on Exhibit 9.

Development Area 7 is estimated to have approximately a 7.5 MW electrical load.

Substation 100 has approximately 12 MW of capacity available. Feeder 11 has an existing load on peak of 2.4 MW, and a capacity of 14.22 MW.

This option will provide 11.82 MW of capacity available at Development Area 7.

The estimated cost to construct the approximately 7,100 feet of overhead line is $ 500,000.

OPTION L: PROVIDE CAPACITY FOR DEVELOPMENT AREA 7 FROM SUBSTATION 100 OVERHEAD TO IMPERIUM DRIVE AND UNDERGROUND TO THE SITE.

Option "L" consists of constructing approximately 6,100 feet of new single circuit 795 AAC overhead power line from the end of Feeder 11, Substation 100 along SR58 to Imperium Drive, approximately 1,000 feet of new single circuit 500 copper underground power line along Imperium Drive to Development Area 7. This route is shown on Exhibit 10.

Development Area 7 is estimated to have approximately a 7.5 MW electrical load.

Substation 100 has approximately 12 MW of capacity available. Feeder 11 has an existing load on peak of 2.4 MW, and a capacity of 14.22 MW.

This option will provide 7.53 MW of capacity available at Development Area 7.

The estimated cost to construct the approximately 6,100 feet of overhead line and 1,000 feet of underground line is $ 610,000.

The options to provide large capacity or dual feeds to the unimproved available building sites:

OPTION M: PROVIDE 13 KV DUAL FEED CAPACITY FOR DEVELOPMENT AREAS 5 OR 6 OVERHEAD

Option "M" " consists of constructing approximately 3,900 feet of new triple circuit 795 AAC overhead power line from Substation 900 to Development Area 5, 3,300 feet of new double circuit 795 AAC overhead power line to Development Area 6, and 13,300 feet of new single circuit 795 AAC overhead power line to Development Area 7 across to Imperium Drive and along SR58 to the end of Feeder 11, Substation 100. This route is shown on Exhibit 11.

Substation 100 has approximately 12 MW of capacity available. Feeder 11 has an existing load on peak of 2.4 MW, and a capacity of 14.22 MW.

This option will provide 11.82 MW of capacity available from substation 100 at 13 kV, or 14.22 MW of capacity available from substation 900 at 13 kV.

The estimated cost to construct the approximately 20,500 feet of overhead line is $ 2,500,000.

OPTION N: PROVIDE 13KV DUAL FEED CAPACITY FOR DEVELOPMENT AREAS 5 OR 6 OVERHEAD/UNDERGROUND

Option "N" " consists of constructing approximately 3,900 feet of new triple circuit 795 AAC overhead power line from Substation 900 to Development Area 5, 3,300 feet of new double circuit 795 AAC overhead power line to Development Area 6, 8200 feet of new single circuit 1000 copper underground power line across Development Areas 6 and 7 to the intersection of Imperium Drive and SR58, and 6100 feet of single circuit 795 AAC power line along SR58 to the end of Feeder 11, Substation 100. This route is shown on Exhibit 12.

Substation 100 has approximately 12 MW of capacity available. Feeder 11 has an existing load on peak of 2.4 MW, and a capacity of 14.22 MW.

This option will provide 10.37 MW of capacity from either substation 100 or substation 900 at 13 kV, the underground cable being the limiting factor.

The estimated cost to construct the approximately 13,000 feet of overhead line and 8200 feet of underground line is $ 3,800,000.

OPTION O: PROVIDE LARGE CAPACITY 69 KV FOR DEVELOPMENT AREA 5 FROM SUBSTATION 900 OVERHEAD

Option "O" consists of constructing approximately 3,900 feet of new 795 AAC 69 kV overhead transmission line with a double circuit 795 AAC underbuild from Substation 900 to Development Area 5.

This option will provide up to 60 MW of capacity at 69 kV to Development Area 5 and allow the line to be continued on to Development Areas 6 and 7 at 13 kV.

The estimated cost to construct the approximately 3,900 feet of overhead 69 kV transmission line with 13 kV underbuild is $ 975,000.

OPTION P: PROVIDE LARGE CAPACITY 69 KV FOR DEVELOPMENT AREA 6 FROM SUBSTATION 900 OVERHEAD

Option "P" consists of constructing approximately 3,900 feet of new 795 AAC 69 kV overhead transmission line with a double circuit 795 AAC underbuild from Substation 900 to Development Area 5 and another 1,900 feet or 3,300 feet of new 795 AAC 69 kV overhead transmission line with a single circuit 795 AAC underbuild to Development Area 6.

This option will provide up to 60 MW of capacity at 69 kV to Development Area 6, 14.22 MW of capacity available at Development Area 5 at 13 kV and allow the line to be continued on to Development Area 7 at 13 kV.

The estimated cost to construct the approximately 5,800 feet of overhead 69 kV transmission line with 13 kV underbuild is $ 1,400,000. For the longer route of approximately 7,200 feet of overhead 69 kV transmission line with 13 kV underbuild our estimated cost is $ 1,600,000.

OPTION Q: PROVIDE LARGE CAPACITY 69 KV FOR DEVELOPMENT AREA 6 FROM SUBSTATION 900 OVERHEAD TO DEVELOPMENT AREA 5 AND UNDERGROUND TO DEVELOPMENT AREA 6

Option "Q" consists of constructing approximately 3,900 feet of new 795 AAC 69 kV overhead transmission line with a double circuit 795 AAC underbuild from Substation 900 to Development Area 5 and another 1,900 feet or 3,300 feet of new 750 copper 69 kV underground transmission line to Development Area 6.

This option will provide up to 60 MW of capacity at 69 kV to Development Area 6, and 14.22 MW of capacity available at Development Area 5 at 13 kV.

The estimated cost to construct the approximately 3,900 feet of overhead 69 kV transmission line with 13 kV underbuild and 1,900 feet of underground 69 kV transmission line is $ 1,800,000. For the longer route of approximately 3,900 feet of overhead 69 kV transmission line with 13 kV underbuild and 3,300 feet of underground 69 kV transmission our estimated cost is $ 2,300,000.

OPTION R: PROVIDE DUAL FEED LARGE CAPACITY 69 KV FOR DEVELOPMENT AREAS 5 OR 6 OVERHEAD

Option "R" consists of constructing approximately 7 miles of new 795 AAC 69 kV overhead transmission line from Substation 100 along SR58 to Imperium drive, across the park and on to Substation 900. This route is shown on Exhibit 13.

This option will provide up to 60 MW of capacity at 69 kV to Development Areas 5, 6, or 7 and provide for dual feeds to one point in the park.

The estimated cost to construct the approximately 7 miles feet of overhead 69 kV transmission line with 13 kV underbuild is $ 7,000,000.

OPTION S: PROVIDE DUAL FEED LARGE CAPACITY 69 KV FOR DEVELOPMENT AREAS 5 OR 6 OVERHEAD/UNDERGROUND

Option "S" consists of constructing approximately 5 miles of new 795 AAC 69 kV overhead transmission line and 2 miles of new 750 copper 69 kV underground transmission line from Substation 100 along SR58 to Imperium drive, across the park and on to Substation 900. This route is shown on Exhibit 13.

This option will provide up to 60 MW of capacity at 69 kV to Development Areas 5, 6, or 7 and provide for dual feeds to one point in the park.

The estimated cost to construct the approximately 5 miles feet of overhead 69 kV transmission line and 2 miles of underground transmission line is $ 9,000,000.

There are currently no electrical commitments for Development Areas 5, 6 or 7. Therefore, for purposes of discussion, the following scenarios of development were assumed.

SCENARIO A: INDUSTRIAL DEVELOPMENTS OF 9.5 MW ON DEVELOPMENT AREA 5, 15 MW ON DEVELOPMENT AREA 6, AND 7.5 MW ON DEVELOPMENT AREA 7.

Scenario "A" consists of an industrial development on Development Area 5 of 9.5 MW, an industrial development on Development Area 6 of 15 MW, and an industrial development on Development Area 7 of 7.5 MW.

With this level of loading, CORED would need to provide 3 separate circuits, one for each development area in order to provide the available capacity. There are several ways this can be constructed, completely overhead, completely underground, or a combination of overhead and underground.

The completely overhead design would be option "G", consisting of a triple circuit 795 AAC line from Substation 900, 3900 feet, to the west corner of Development Area 5 following the right of way already obtained by CORED. From there, a double circuit 795 line would continue to the west corner of Development Area 6, following routing and right of way that would have to be obtained. At that point, the line would change to a single circuit 795 AAC line and continue to Development Area 7, again following routing and right of way that would have to be obtained by CORED.

The completely underground design would be option "J", consisting of four circuits of 1000 copper underground cable in a duct bank from Substation 900, 3900 feet, to the west corner of Development Area 5 following the right of way already obtained by CORED. From there, three circuits of 750 copper underground cable in a duct bank would continue to the west corner of Development Area 6, following routing and right of way that would have to be obtained. At that point, the line would change to a single circuit of 500 copper underground cable and continue to Development Area 7, again following routing and right of way that would have to be obtained by CORED.

The combination overhead and underground design would be options "H" and "I". In both options, it would begin overhead with a triple circuit 795 AAC overhead line from Substation 900, 3900 feet, to the west corner of Development Area 5 following the right of way already obtained by CORED. From there, either a double circuit 795 overhead line as in option "H", or three circuits of 750 copper underground cable in a duct bank as in option "I", would continue to the west corner of Development Area 6 following routing and right of way that would have to be obtained. At that point, the line would change to a single circuit of 500 copper underground cable and continue to Development Area 7, again following routing and right of way that would have to be obtained by CORED.

SCENARIO B: A LARGE DATA CENTER REQUIRING 60 MW AND A DUAL FEED ON DEVELOPMENT AREA 5, 30 MW ON DEVELOPMENT AREA 6, AND 15 MW ON DEVELOPMENT AREA 7.

Scenario "A" consists of a large data center on Development Area 5 of 60 MW and requiring a dual feed, a large industrial development on Development Area 6 of 30 MW, and an industrial development on Development Area 7 of 15 MW.

With this level of loading, CORED would need to provide a 69 kV transmission line from Substation 900 looping through a substation in the industrial park and continuing on to Substation 100. As in all of the scenarios, there are several ways that this can be constructed, completely overhead, completely underground, or a combination of overhead and underground.

The completely overhead design would be option "R", consisting of a 69 kV transmission line with a triple circuit 795 AAC underbuild line from Substation 900, 3900 feet, to the west corner of Development Area 5 following the right of way already obtained by CORED. From there, it would continue to the west corner of Development Area 6, following routing and right of way that would have to be obtained. At that point, the line would change to 69 kV transmission line with a single circuit 795 AAC underbuild line and continue to Development Area 7, again following routing and right of way that would have to be obtained by CORED. From Development Area 7, the 69 kV transmission line would continue along Imperium Drive, and along SR58 to Substation 100.

The completely underground design, although possible, would be prohibitively expensive. Obtaining exclusive right of way, and constructing the underground 69 kV transmission line the approximately 4 miles along SR58 from Substation 100 to Imperium Drive is estimated at $12,000,000. To cross under Poplar Creek from Substation 900 with a 69 kV underground line and continue underground to Development Area 5 is estimated at $3,500,000. This does not include the 13 kV underground distribution lines to serve Development Areas 6 and 7. In order to place all of the transmission and distribution lines underground, with sufficient capacities to serve the loads in this scenario, the estimated cost is $25,000,000.

The combination overhead and underground design would be option "Q", consisting of a 69 kV transmission line with a triple circuit 795 AAC underbuild line from Substation 900, 3900 feet, to the west corner of Development Area 5 following the right of way already obtained by CORED. From there, it would continue to the west corner of Development Area 6, following routing and right of way that would have to be obtained. At that point, the line would change to 69 kV underground transmission line with a single circuit underground distribution line and continue to Development Area 7, again following routing and right of way that would have to be obtained by CORED. The 69 kV underground transmission line would cross Development Area 7 and along Imperium Drive to SR58, where it would change to overhead along SR58 to Substation 100.

SCENARIO C: HEAVY INDUSTRIAL DEVELOPMENTS OF 20 MW ON DEVELOPMENT AREA 5, 30 MW ON DEVELOPMENT AREA 6, AND 15 MW ON DEVELOPMENT AREA 7.

Scenario "C" consists of a heavy industrial development on Development Area 5 of 20 MW, a heavy industrial development on Development Area 6 of 30 MW, and a heavy industrial development on Development Area 7 of 15 MW.

With this level of loading, CORED would need to provide 5 separate circuits at 13 kV, two for Development Area 5, two for Development Area 6 and one for Development Area 7 in order to provide the available capacity. It is possible to provide five additional circuits from Substation 900, however, constructing five circuits on a single pole line would be not be advisable due to the reliability. Substation 100 does not have the capacity at 13 kV to supply this level of loading.

For a total of 65 MW of load, providing 69 kV transmission to the park would be the preferred approach. A substation could be sited on either Development Area 5 or 6, and the remainder of the sites served from this location. This would reduce the length and exposure of the 13 kV circuits and provide a better reliability for the industries located in the park.

For this scenario, we are assuming the substation to be located on the site with the largest load, development area 6. As in all of the scenarios, there are several ways that this can be constructed and various options for serving the individual development areas. We are going to discuss a single 69 kV feed to development area 6 from Substation 900, and not discuss the associated distribution lines that would be required to serve the development areas.

The completely overhead design would be similar to option "P", consisting of a 69 kV transmission line from Substation 900, 3900 feet, to the west corner of Development Area 5 following the right of way already obtained by CORED. From there, it would continue to the west corner of Development Area 6, following routing and right of way that would have to be obtained by CORED.

The completely underground design, although possible, would again be prohibitively expensive. To cross under Poplar Creek from Substation 900 with a 69 kV underground line and continue underground to Development Area 5 is estimated at $3,500,000. Continuing the 69 kV underground lines to Development Area 6 would add an additional $700,000 to $1,200,000 dependent on the routing and right of way that would have to be obtained by CORED.

The combination overhead and underground design would be similar to option "Q. It would begin with a 69 kV overhead line from Substation 900, 3900 feet, to the west corner of Development Area 5 following the right of way already obtained by CORED. From there, a single circuit 750 copper 69 kV underground cable in a duct bank would continue to the west corner of Development Area 6 following routing and right of way that would have to be obtained by CORED.

Each of the undeveloped building sites were examined based on size, location, and comparable industrial sites and an estimated electrical loading was determined for each available site. The three major sites, identified as development areas, have estimated loadings of:

- Development Area 5 9.5 MW
- Development Area 6 15 MW
- Development Area 7 7.5 MW

In addition, existing and proposed conductors were analyzed, and capacities were determined based on published ampacities, and the MVA capacity was determined based on a 75% power factor. These are shown in Appendix C.

The existing electrical infrastructure was determined based on information obtained from CORED. Each section of the existing infrastructure was examined and a capacity determined along with the existing and committed loadings. The existing committed and installed capacities are shown in Appendix D.

The total installed capacity is 9 MVA, including 2.5 MVA at Carbon Fiber, 5 MVA at Thereagenics, and the remaining 1.5 MVA is spread out among an additional five sites. The industrial park is served by feeder 95, which begins as a 795 AAC overhead circuit, changing to a 336 ACSR overhead circuit, and then to a parallel 350 copper UG circuit, arriving at a set of switchgear. From the switchgear, a 500 copper underground circuit feeds Theragenics, a 350 copper underground circuit feeds Carbon Fiber, and a 4/0 copper underground circuit feeds the additional five sites.

The 795 AAC overhead feeder has a capacity of 14.22 MW which is adequate for the existing and committed electrical loads. However the 336 ACSR overhead has a capacity of 8.41 MW and the parallel 350 copper underground section has a capacity of 10.71 MW. With a total committed loading of 13.3 MVA, these two sections will be overloaded as the load increases. The remaining underground circuits are adequate for both the existing and committed electrical loads.

This project was broken down into three sections, options to upgrade and reinforce the existing infrastructure, options to provide adequate electric capacity to the available unimproved building sites, and options to provide large capacity or dual feeds to the available unimproved building sites. Each section was looked at for possible options utilizing both overhead and underground conductors.

Several options to upgrade the existing infrastructure were identified along with many options available to serve the available unimproved building sites. The park lies within 1 mile of Substation 900, and approximately 4 miles from Substation 100 making dual feeds at 13 kV and 69 kV possible. Substation 900 has an available capacity of approximately 70 MW, and substation 100 has an available capacity of approximately 12 MW. Options for large capacity and dual feeds were also investigated. A summary of various options and their estimated construction costs are shown in Appendix D.

For the three larger development areas, three different scenarios of possible loadings were discussed, and the options to serve each of these scenarios was developed. Various combinations of overhead and underground were investigated, and the construction cost for each option was estimated.

Portions of the existing infrastructure will be overloaded whenever the existing and committed facilities are constructed and in full operation. The existing feeder to the park contains a section of 336 ACSR overhead conductor and a section of parallel 350 copper underground conductor which have capacities of 8.41 MW and 10.71 MW respectively. As the committed loading is 13.3 MVA, these sections will need to be upgraded in the future as the commitments are fulfilled.

CCI understands that installed capacity does not necessarily equate to actual used capacity, and recommends that the loading of these line sections be monitored, and that they be upgraded when the actual loads are within 20 percent of capacity. Unless there is a change in the committed loads, CCI recommends that the 336 ACSR line section be reconductored to 795 AAC, and that an additional underground circuit be added to feed the existing 4/0 underground circuit as shown in Option C. This would bring the existing facilities to 14.22 MW capacity, exceeding the existing electrical commitments. The estimated cost to upgrade these line sections is $460,000 for the 336 ACSR section, and $260,000 to install an additional 350 copper underground section.

Various options have been examined to serve the three remaining large sites. The most economical and reliable means of serving any future loads will be dependent on the size, location and character of such loads. Additional easements will need to be obtained, which may also dictate the location and type of lines to be constructed. With the actual loads for each site yet to be determined, but with the possible electrical loadings that have been discussed, CCI is recommending a phased approach to providing electrical service to these three development areas.

With all this in mind, CCI recommends that initially a single 13 kV 795 AAC overhead power line be constructed using the existing electrical easement that runs along the northwest side of the park to the corner of Development Area 5. This line should be designed for a 69 kV circuit with a triple circuit underbuild, and poles capable of supporting this construction should be installed. By designing for this construction, but only installing one circuit, it would be reasonably cost effective to install additional circuits should the actual loads dictate. The estimated cost for the initial installation is $700,000. Each additional 13 kV circuit is estimated at $150,000, and to install a 69 kV circuit should it be desired is estimated at $250,000.

Also, CCI recommends that CORED pursue obtaining the additional right of way that would be necessary to extend this power line to Development Area 6, and on to Development Area 7. The shorter of the two routes would be preferred as it would be less expensive to construct, however it is also recognized that obtaining the easement and the restrictions that may be imposed could be such that the longer route may be more cost effective.

As before, CCI recommends that initially a single 13 kV 795 AAC overhead power line be constructed using the electrical easement to be obtained by CORED along the northwest side of Development Area 5 and to the corner of Development Area 6. This line should also be designed for a 69 kV circuit but with a double circuit underbuild, and poles capable of supporting this construction should be installed. The estimated cost for the initial installation is $350,000 for the shorter route and $450,000 for the longer route. An additional 13 kV

circuit is estimated at $70,000 or 120,000, and to install a 69 kV circuit should it be desired is estimated at $100,000 or $160,000.

In order to serve Development Area 7, CCI recommends that initially a single 13 kV 795 AAC overhead power line be constructed using the electrical easement to be obtained by CORED along the northwest side of Development Area 6 to Development Area 7. We are not recommending that this line not be designed for a 69 kV circuit at this time. The estimated cost for the initial installation is $500,000.

CCI feels that this is the most flexible and economical method of providing an initial electric infrastructure to the three undeveloped areas of Horizon Park. For an investment of between $1,650,000 and $1,550,000 an initial capacity of 14.22 MW would be available, which can be upgraded to 42.66 MW or more at a later date if the additional capacity should be required. Most, if not all of the infrastructure would be located at the back property line of the developments.

It is noted here that CCI would not recommend an underground electric infrastructure to be installed at this time. The reasons for this are as follows:

- The inflexible nature of an underground system. In order to provide for the possibilities of the various industries that could possibly locate in the park, a large duct system would have to be installed initially, along with the required pullboxes, switchgear locations, and other underground infrastructure. Whereas it is relatively cost effective to add additional circuits to an overhead line as long as it has been designed for such, a large portion of the underground cost is in the duct system, which would need to be installed as part of the initial infrastructure. It should be pointed out that installing a duct bank may also be detrimental to the adjoining vegetation, as the trench required will usually cut the root system of adjoining trees, which may cause them to suffer and eventually die.

- The effects of loading and proximity in an underground system serve to derate the capacity of the underground cables installed. Unlike an overhead conductor, which is normally installed in open air with a four to five foot spacing, each conductor does not tend to effect the adjoining conductors. In an underground system, the conductors are much closer together, and the nature of underground cable construction changes the cooling characteristics. The heat developed by one cable, will effect the other cables in the duct system, lowering the available capacity. Underground cables do not cool as fast as overhead conductors, which also has an effect on the available capacity. This derating requires underground cables to be sized larger in order to maintain the same capacity as overhead cables. Should underground be installed, it is recommended that the soil thermal resistivity and duct bank design be carefully studied in order to determine the required duct configuration and cable size required.

- Last is the cost of an underground system. A typical underground distribution system is three to four times as expensive to install as a comparable overhead distribution system. As shown in option "G", an overhead distribution system that is upgradable to 69 kV is estimated at $2,000,000. Option "J", an underground system which is not upgradable is estimated at $6,000,000.

The estimated costs provided in this report do not include engineering costs, easement acquisition costs, environmental study costs, substation modification costs, or other costs outside of the known access and construction method restrictions.

ESTIMATED ELECTRICAL LOADINGS FOR UNDEVELOPED AREAS

Site Designation	Acreage	Estimated Electrical Loading			
		Office/ Warehouse	*Industrial*	*Heavy Industrial*	*Computers/ Data Center*
Development Area 5	94.18	2 MW	*9.5 MW	20 MW	66 MW
Development Area 6	156.0	3 MW	*15 MW	30 MW	100 MW
Development Area 7	74.49	1.5 MW	*7.5 MW	15 MW	52 MW
Lot 2, Next to ORNL	1.56	*0.1 MW	0.2 MW	0.3 MW	1 MW
Lot 3, Novitas Place	1.65	*0.1 MW	0.2 MW	0.3 MW	1 MW

*Estimated electrical demand, based on the location, lot size and shape, and comparable industrial sites

INSTALLED AND PROJECTED ELECTRICAL LOADINGS

Tenant/Site Designation	Acreage	Projected Capacity	Installed Capacity
Carbon Fiber (19BC)	20.49	5 MVA	2.5 MVA
Theragenics (18BC)	21.17	5 MVA	5 MVA
ORNL Campus	39.23	1.5 MVA	0 MVA
Conference Room	2.12	0.3 MVA	0.3 MVA
Lot X (17 BF)	11.75	0.3 MVA	0 MVA
Philotechnics	--	0.5 MVA	0.5 MVA
Cell Tower	--	0.1 MVA	0.1 MVA
Sewage Lift Station (Novas Drive)	--	0.3 MVA	0.3 MVA
Sewage Lift Station (Imperium Drive)	--	0.3 MVA	0.3 MVA
Total		**13.3 MVA**	**9.0 MVA**

CONDUCTOR CAPACITIES

Conductor	Ampacity*	Ampacity at 75% PF	Power Capacity
12.5 kV Ratings			
4/0 Copper UG	295 A	221.24 A	4.78 MW
1) 350 Copper UG	390 A	292.50 A	6.32 MW
2) 350 Copper UG	663 A	497.25 A	10.74 MW
3) 350 Copper UG	877 A	657.75 A	14.21 MW
500 Copper UG	465 A	348.75 A	7.53 MW
2) 500 Copper UG	790 A	592.50 A	12.79 MW
1) 750 Copper UG	565 A	423.75 A	9.15 MW
2)750 Copper UG	960 A	720.00 A	15.55 MW
1000 Copper UG	640 A	480.00 A	10.37 MW
336 ACSR OH	519 A	389.25 A	8.41 MW
795 AAC OH	878 A	658.50 A	14.22 MW
69 kV Ratings			
750 Copper UG	742 A	556.50 A	66.5 MW
795 AAC OH	878 A	658.50	78.7 MW

*12.5 kV UG Ratings and OH Ratings from Southwire Data, 69 kV UG Rating from Okonite Data

SUMMARY OF OPTION COSTS

UPGRADE AND REINFORCE EXISTING INFRASTRUCTURE OPTIONS:

- **Option A:** Replace (Reconductor) the existing 336 ACSR overhead conductor with 795 AAC conductor — $460,000
- **Option B:** Add a second circuit to the existing 336 ACSR overhead portion — $650,000
- **Option C:** Reconductor the existing 336 ACSR overhead portion to 795 AAC and increase the underground capacity to match. — $720,000
- **Option D:** Add a second circuit to the existing 336 ACSR overhead portion and add additional underground capacity to match the new overhead conductor. — $1,250,000

OPTIONS TO PROVIDE ADEQUATE ELECTRICAL CAPACITY TO THE UNIMPROVED AVAILABLE BUILDING SITES:

- **Option E:** Provide capacity for Development Areas 5 and 6 from Substation 900 overhead with future 69 kV to Development Area 6 — $1,120,000/$1,260,000
- **Option F:** Provide capacity for Development Areas 5 and 6from Substation 900 overhead to Development Area 5 and underground to Development Area 6 with future 69 kV to Development Area 5 — $1,510,000/$1,960,000
- **Option G:** Provide capacity for Development Areas 5, 6 and 7 from Substation 900 overhead with future 69 kV to Development Area 6 — $1,800,000/$2,000,000
- **Option H:** Provide capacity for Development Areas 5, 6 and 7from Substation 900 overhead to Development Area 6 and underground to Development Area 7, with future 69 kV to Development Area 6 — $2,400,000/$2,700,000
- **Option I:** Provide capacity for Development Areas 5, 6 and 7 from Substation 900 overhead to Development Area 5 and underground to Development Areas 6 and 7, with future 69 kV to Development Area 5 — $3,050,000/$3,800,000

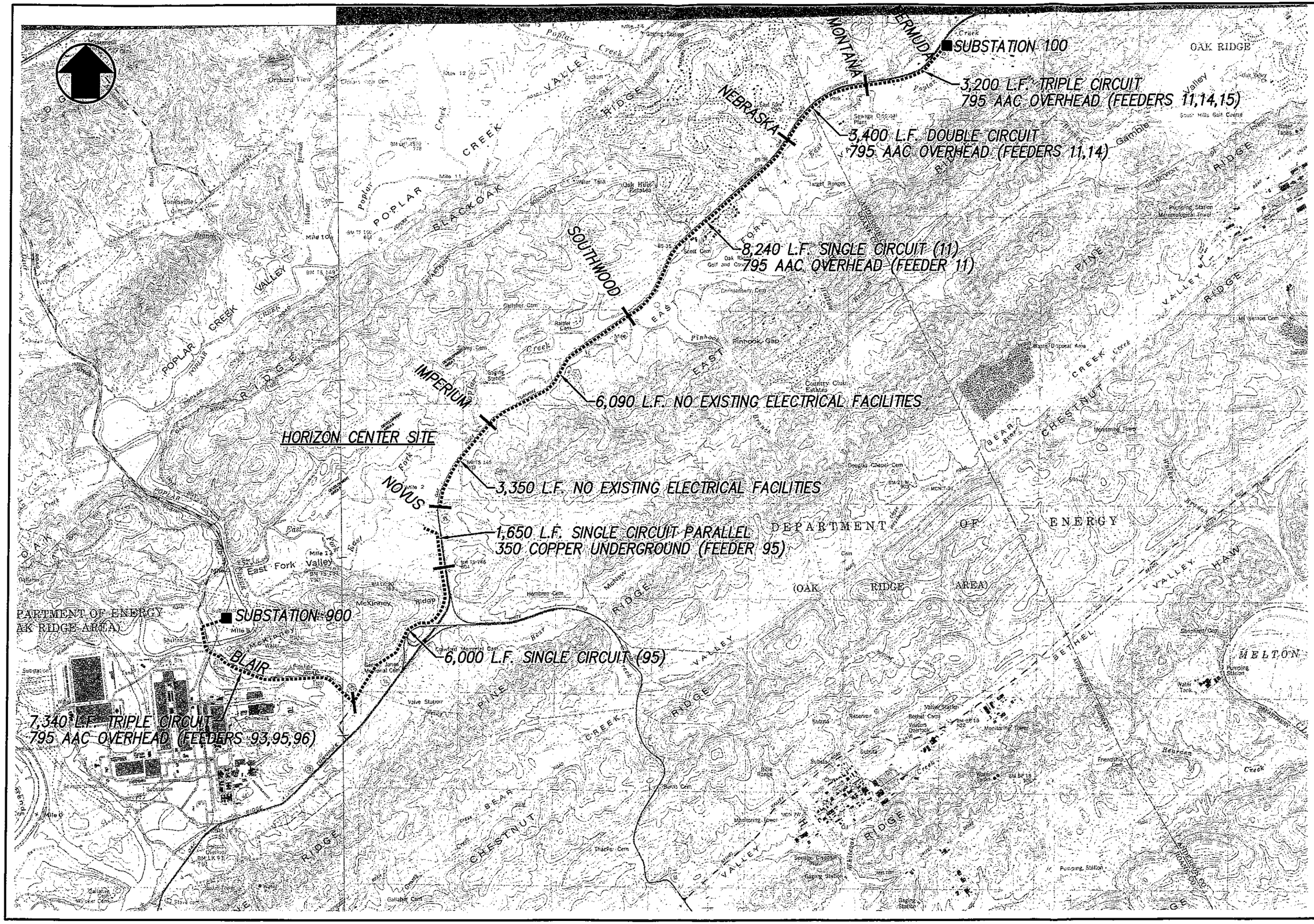
- **Option J:** Provide capacity for Development Areas 5, 6 and 7 from Substation 900 Underground with no provisions for future 69 kV — $5,300,000/$6,000,000
- **Option K:** Provide capacity for Development Area 7 from Substation 100 overhead — $500,000
- **Option L:** Provide capacity for Development Area 7 from Substation 100 overhead to Imperium Drive and underground to the site — $610,000

OPTIONS TO PROVIDE LARGE CAPACITY OR DUAL FEEDS TO THE UNIMPROVED AVAILABLE BUILDING SITES:

- **Option M:** Provide 13 kV dual feed capacity for Development Areas 5 or 6 overhead — $2,500,000
- **Option N:** Provide 13kV dual feed capacity for Development Areas 5 or 6 overhead/underground — $3,800,000
- **Option O:** Provide large capacity 69 kV for Development Area 5 from Substation 900 overhead — $975,000
- **Option P:** Provide large capacity 69 kV for Development Area 6 from Substation 900 overhead — $1,400,000/$1,600,000
- **Option Q:** Provide large capacity 69 kV for Development Area 6 from Substation 900 overhead to Development Area 5 and underground to Development Area 6 — $1,800,000/$2,300,000
- **Option R:** Provide dual feed large capacity 69 kV for Development Areas 5 or 6 overhead — $7,000,000
- **Option S:** Provide dual feed large capacity 69 kV for Development Areas 5 or 6 overhead/underground — $9,000,000

Notes:

All cost figures do not include engineering or easement acquisition costs.
Options to provide large capacity are at 69 kV and do not include substation costs.



SHEET NO. E1.01

JOB NO. 00975-0002

CITY OF OAK RIDGE
EXHIBIT 1
LOCATION MAP

DRAWN BY	WBW
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DATE	3-6-2013
SCALE	1"=3,000'
CCI PROJ. NO.	00975-0002

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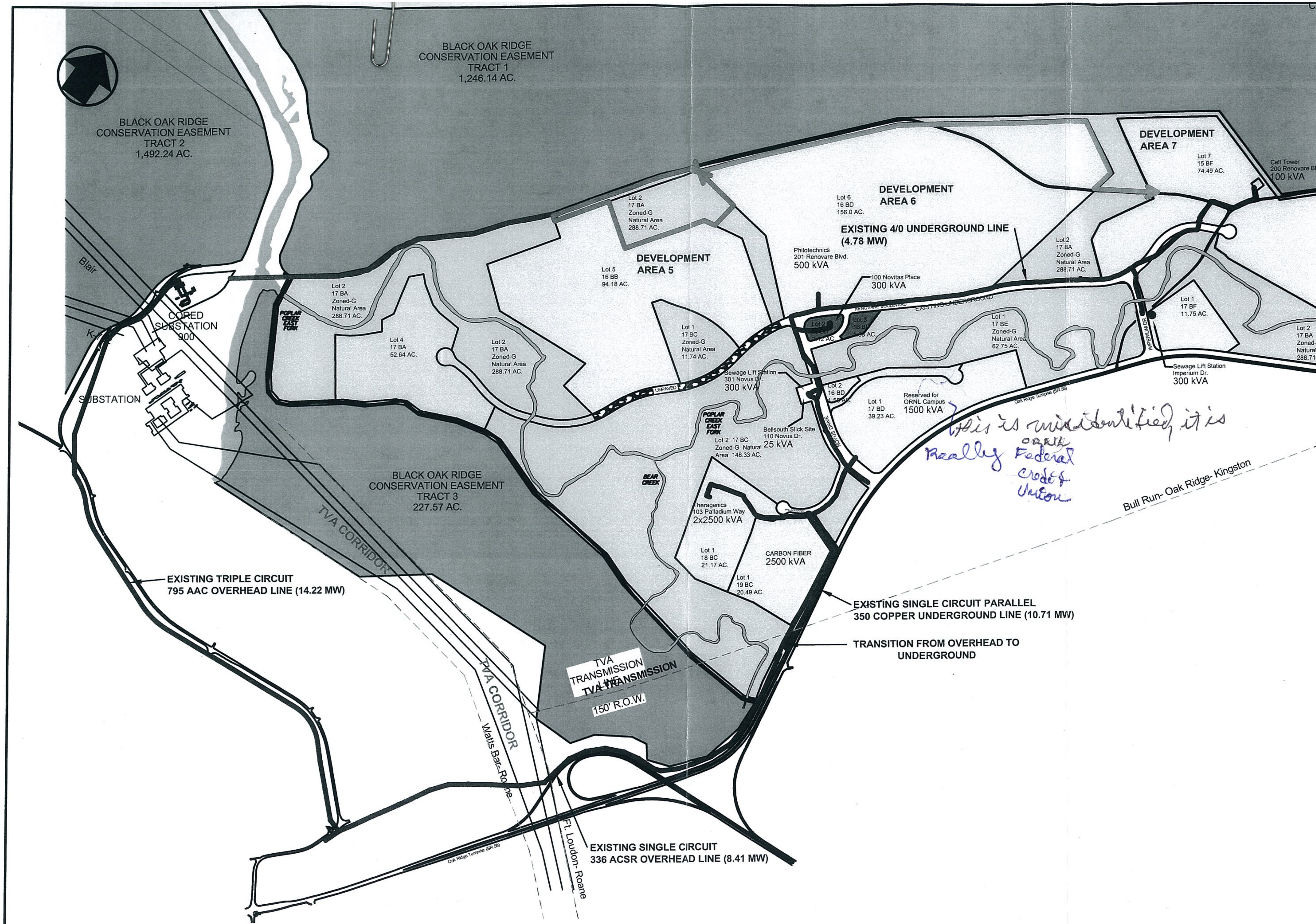
BLACK OAK RIDGE
CONSERVATION EASEMENT
TRACT 1
1,246.14 AC.
BLACK OAK RIDGE
CONSERVATION EASEMENT
TRACT 2
1,492.24 AC.
BLACK OAK RIDGE
CONSERVATION EASEMENT
TRACT 3
227.57 AC.
DEVELOPMENT AREA 5
DEVELOPMENT AREA 6
DEVELOPMENT AREA 7
EXISTING 4/0 UNDERGROUND LINE
(4.78 MW)
Cell Tower
100 kVA
Lot 7
15 BF
74.49 AC.
Lot 6
16 BD
156.0 AC.
Lot 5
16 BB
94.18 AC.
Philotechnics
201 Renovare Blvd.
500 kVA
100 Novitas Place
300 kVA
Sewage Lift Station
301 Novus Dr.
300 kVA
Sewage Lift Station
Imperium Dr.
300 kVA
Reserved for
ORNL Campus
1500 kVA
Bellsouth Slick Site
110 Novus Dr.
25 kVA
Theragenics
103 Palladium Way
2x2500 kVA
CARBON FIBER
2500 kVA
CORED
SUBSTATION
900
SUBSTATION
Blair
TVA CORRIDOR
TVA TRANSMISSION
150' R.O.W.
Watts Bar- Roane
Ft. Loudon- Roane
Bull Run- Oak Ridge- Kingston
EXISTING TRIPLE CIRCUIT
795 AAC OVERHEAD LINE (14.22 MW)
EXISTING SINGLE CIRCUIT PARALLEL
350 COPPER UNDERGROUND LINE (10.71 MW)
TRANSITION FROM OVERHEAD TO
UNDERGROUND
EXISTING SINGLE CIRCUIT
336 ACSR OVERHEAD LINE (8.41 MW)
this is misidentified it is
Really ORNL Federal Credit Union

CITY OF OAK RIDGE
EXHIBIT 2
EXISTING FACILITIES

SHEET NO. E1.02
JOB NO. 00975-0002

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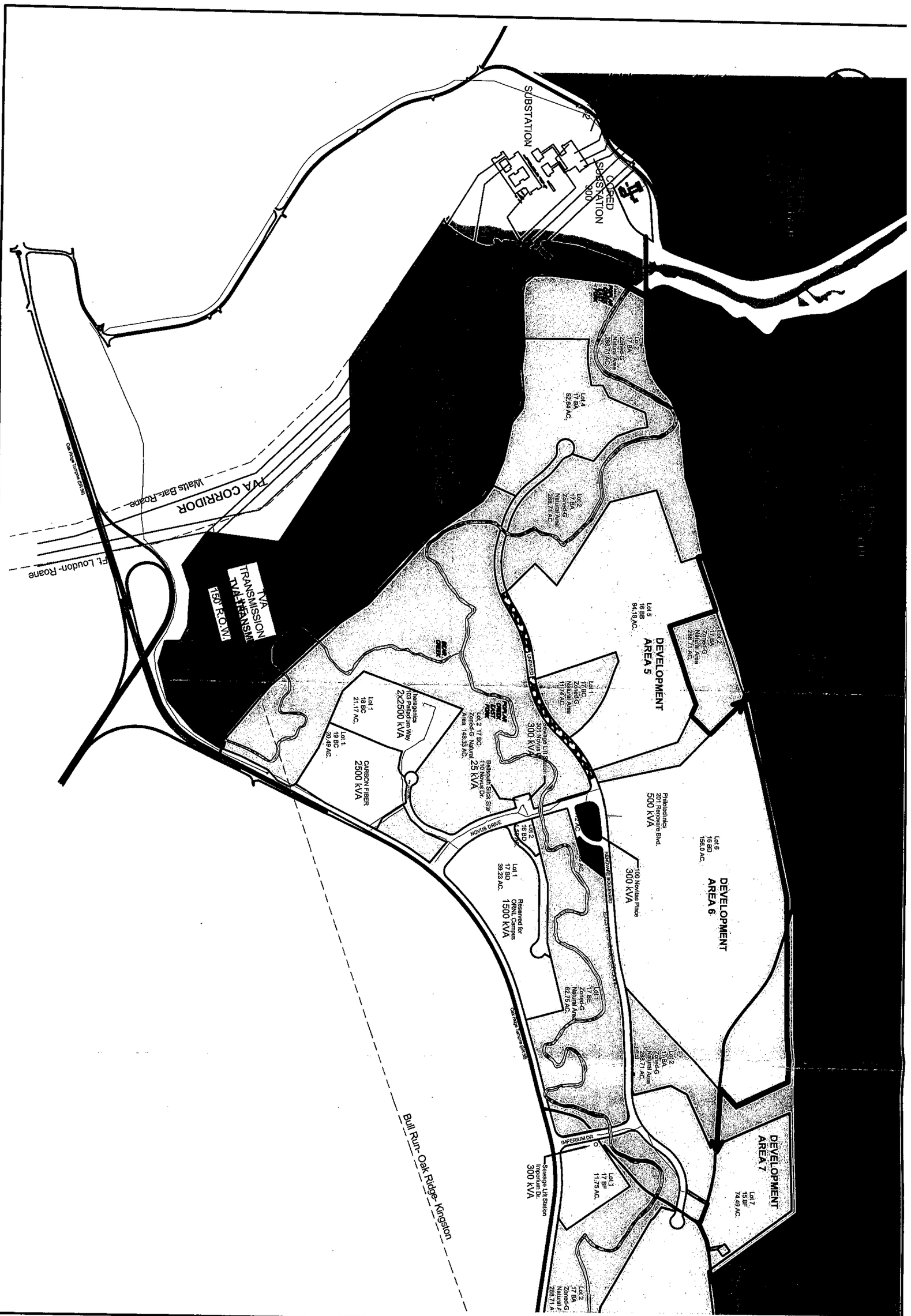

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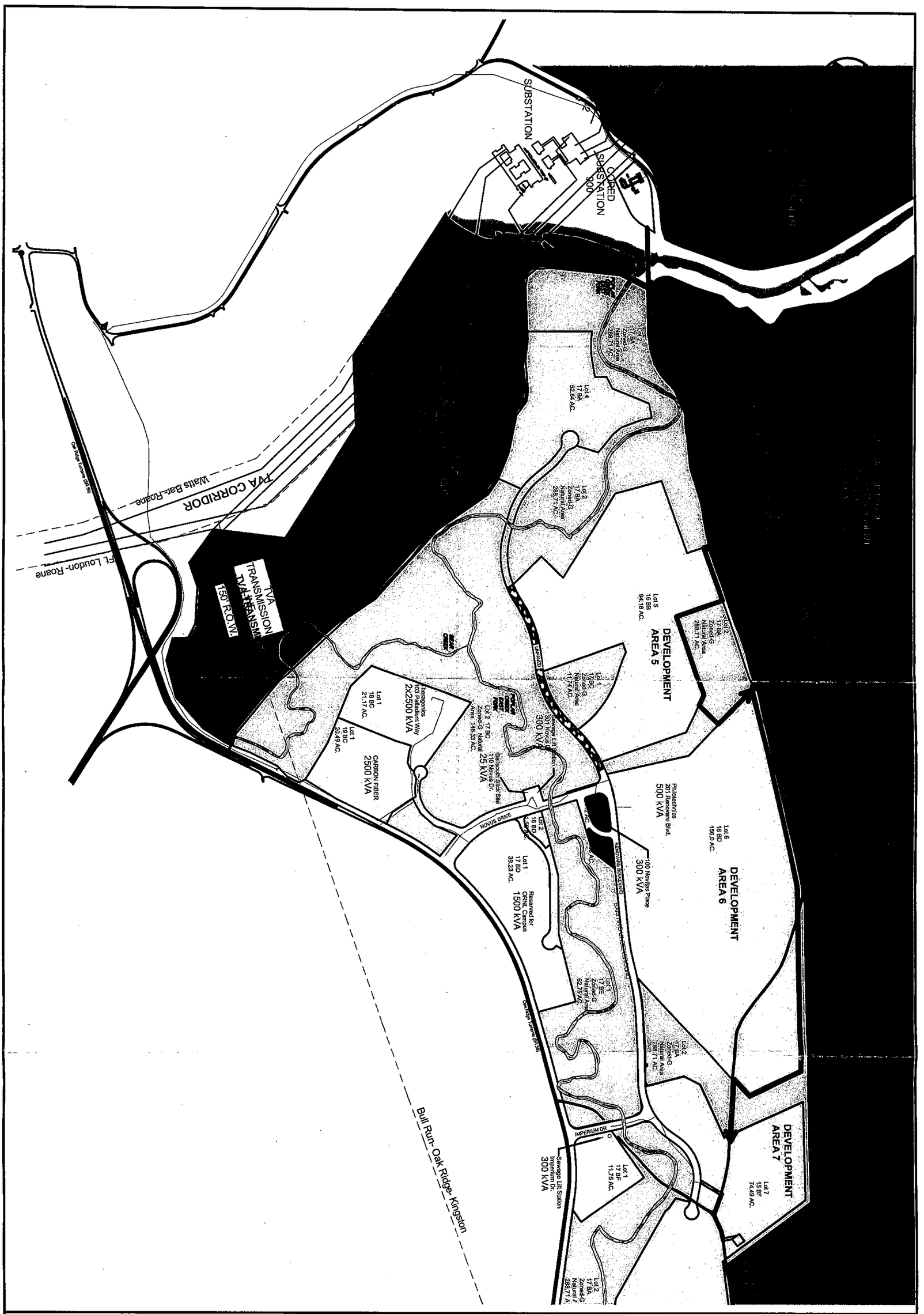
CITY OF OAK RIDGE
EXHIBIT 3
DA 5 & 6 FROM SUB 900

SHEET NO. E1.03

JOB NO. 00975-0002



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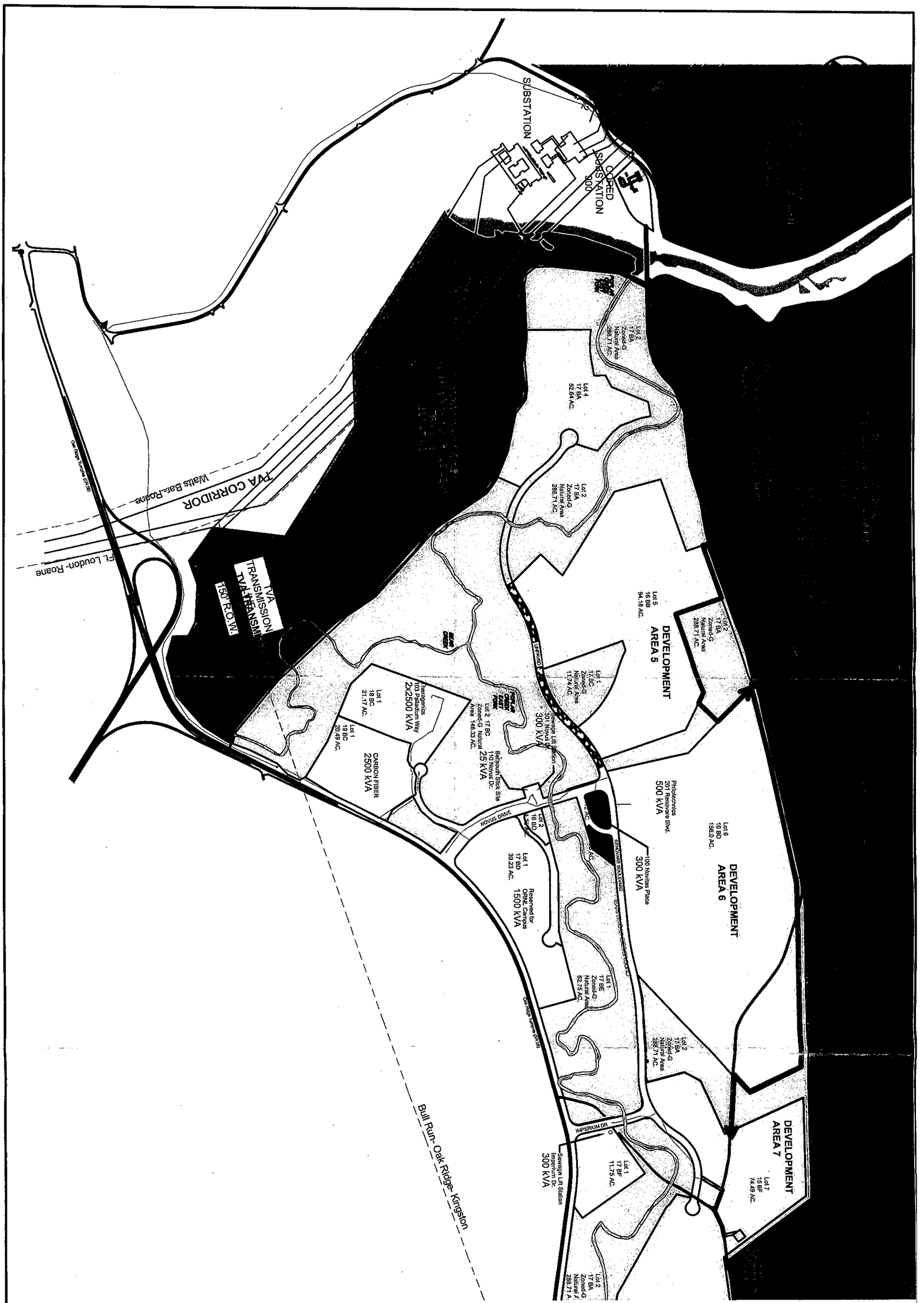
CITY OF OAK RIDGE
EXHIBIT 4
DA 5 & 6 FROM SUB 900

SHEET NO. E1.04

JOB NO. 00975-0002



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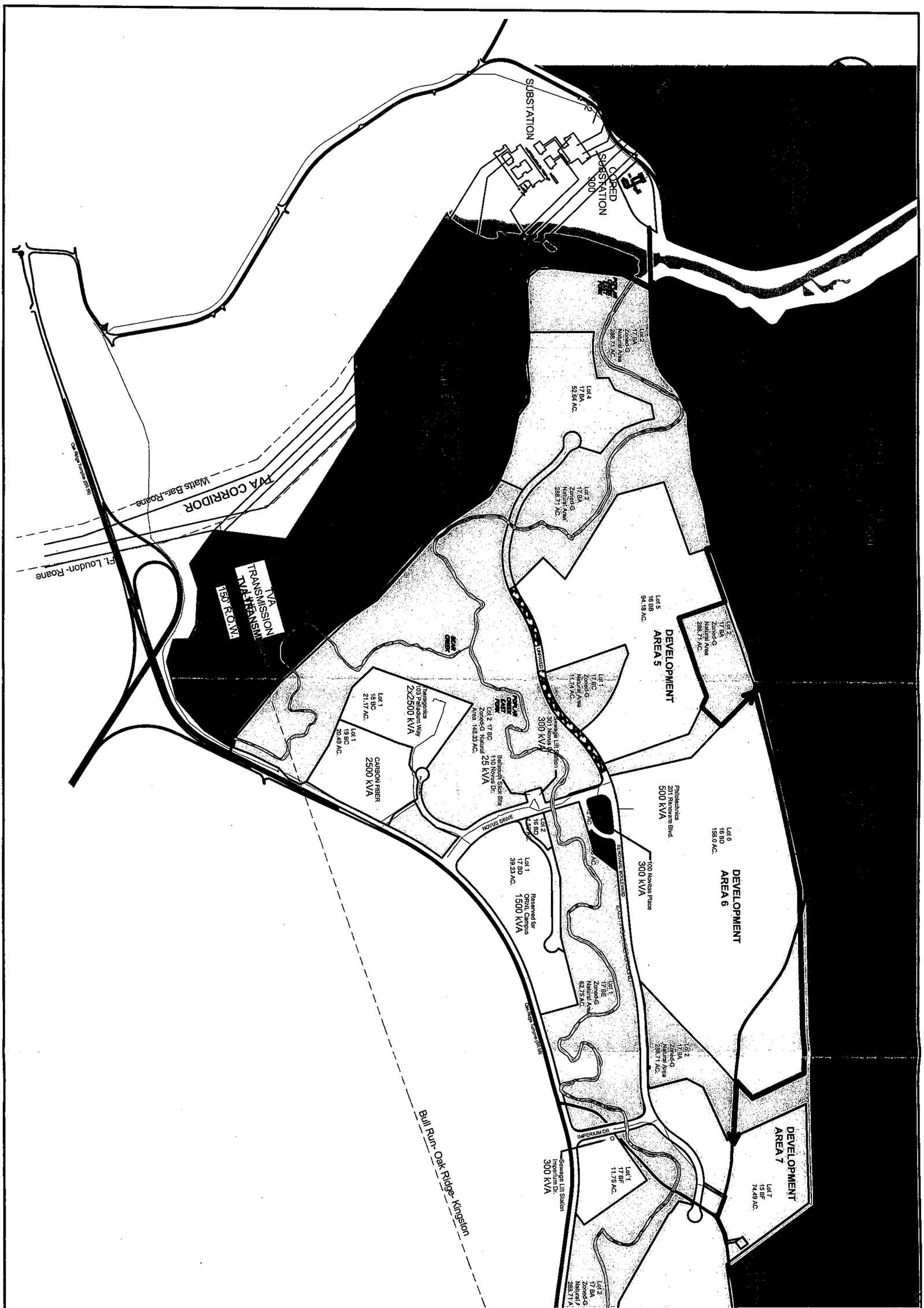
CITY OF OAK RIDGE
EXHIBIT 5
DA 5, 6 & 7 FROM SUB 900

SHEET NO.
E1.05
JOB NO.
00975-0002



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CITY OF OAK RIDGE
EXHIBIT 6
DA 5, 6 & 7 FROM SUB 900

SHEET NO.
E1.06
JOB NO.
00975-0002

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DATE	3-6-2013
SCALE	1"=1,200'
CCI PROJ. NO.	00975-0002

CITY OF OAK RIDGE
EXHIBIT 7
DA 5, 6 & 7 FROM SUB 900

SHEET NO.
E1.07
JOB NO.
00975-0002

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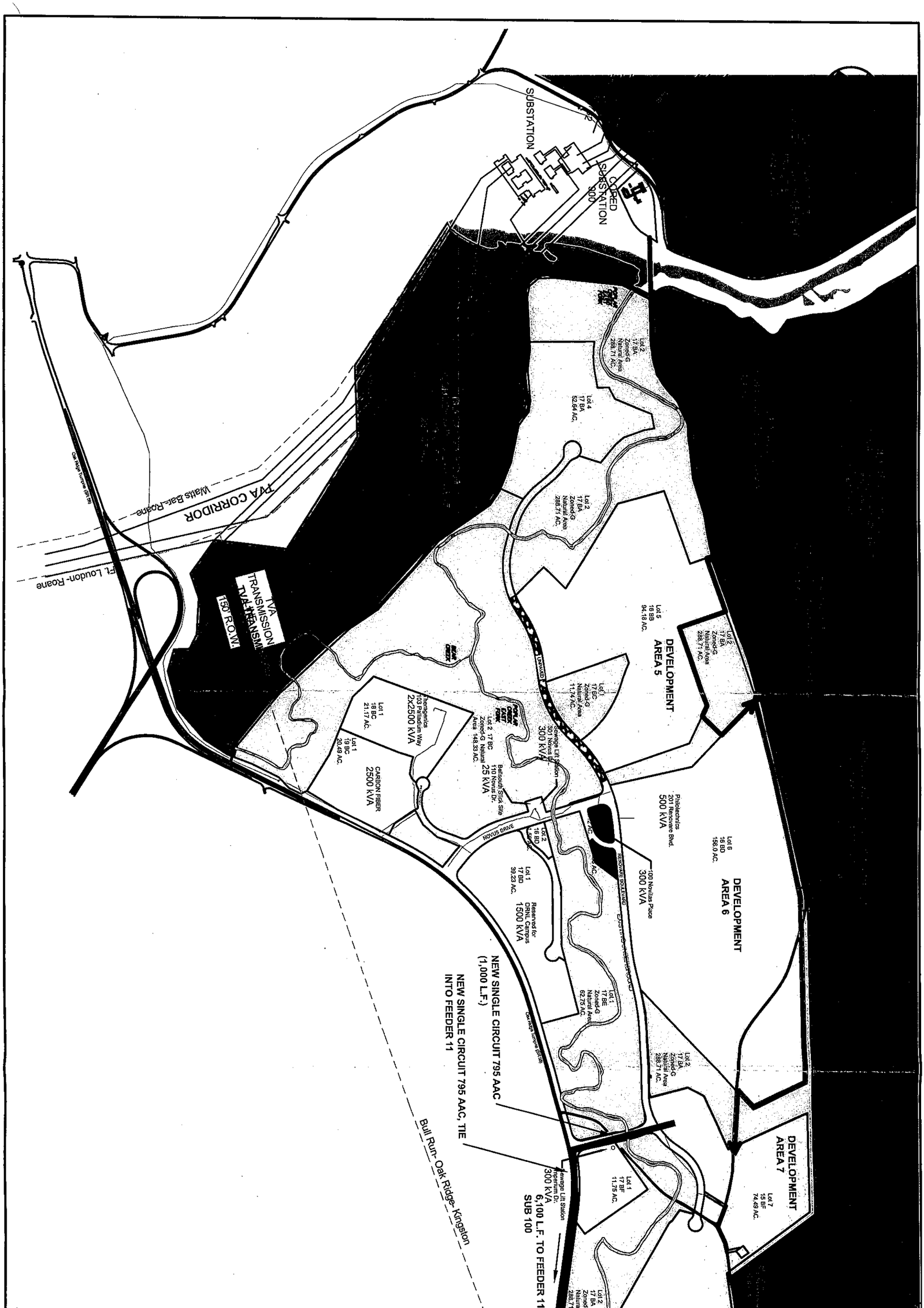
SCALE	1"=1,200'
CCI PROJ. NO.	00975-0002

CITY OF OAK RIDGE
EXHIBIT 8
DA 5, 6 & 7 FROM SUB 900

SHEET NO.
E1.08
JOB NO.
00975-0002



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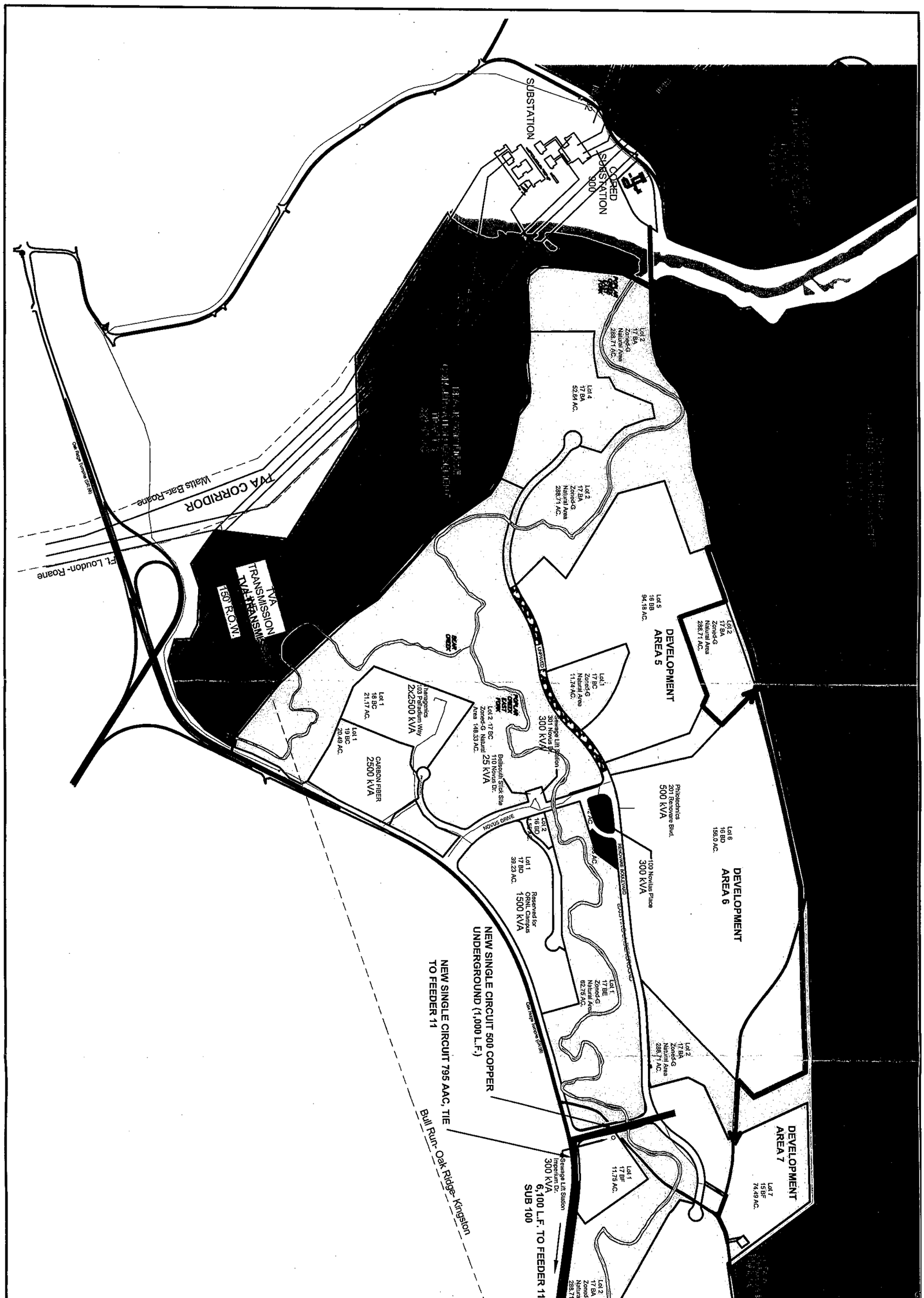
DRAWN BY	WBW
CHECKED BY	JLM
DATE	3-6-2013
SCALE	1"=1,200'
CCI PROJ. NO.	00975-0002

CITY OF OAK RIDGE
EXHIBIT 9
DA 7 FROM SUB 100

SHEET NO.
E1.09
JOB NO.
00975-0002



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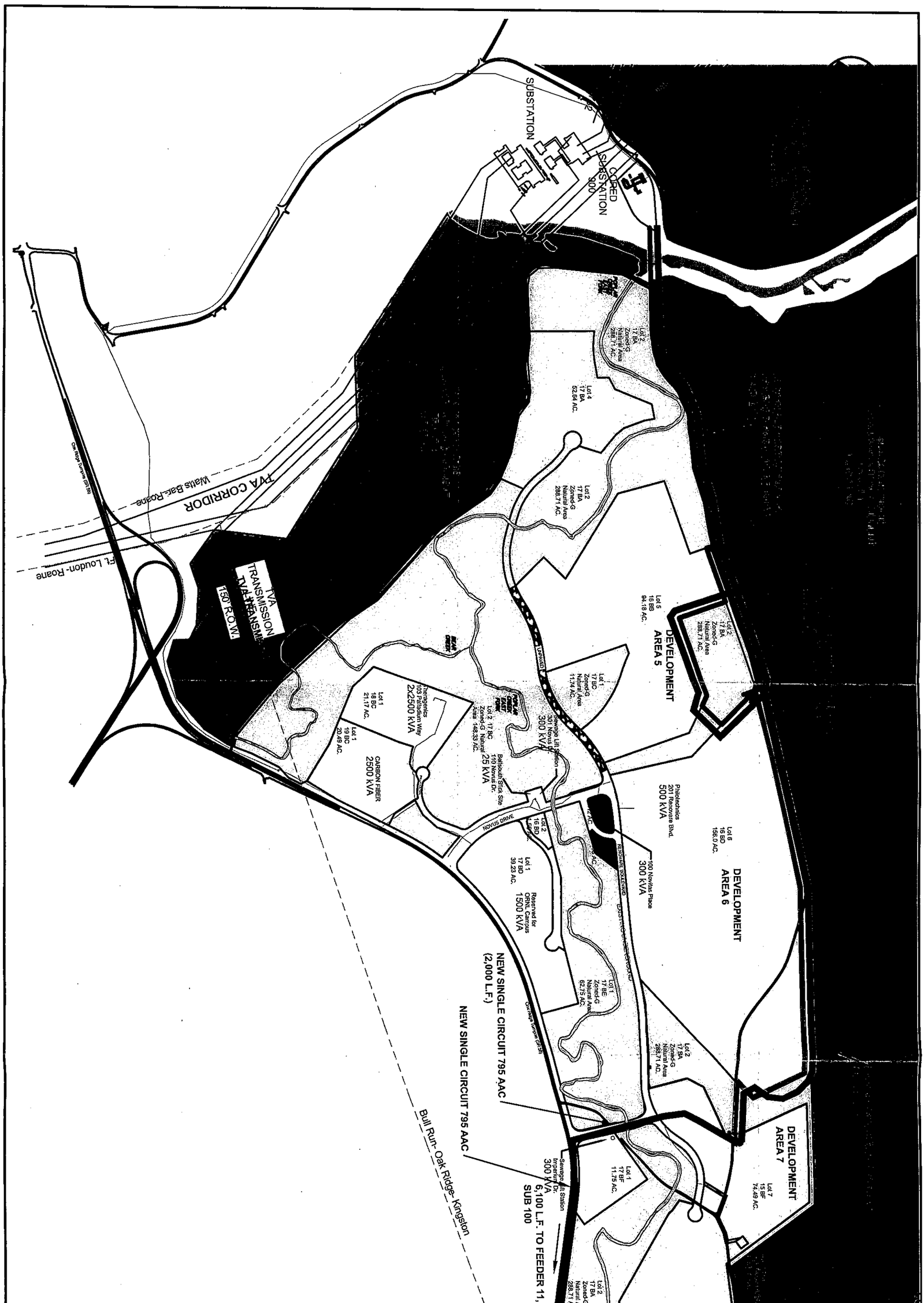
CHECKED BY	JLM
DATE	3-6-2013
SCALE	1"=1,200'
CCI PROJ. NO.	00975-0002

CITY OF OAK RIDGE
EXHIBIT 10
DA 7 FROM SUB 100

SHEET NO.
E1.10

JOB NO.
00975-0002



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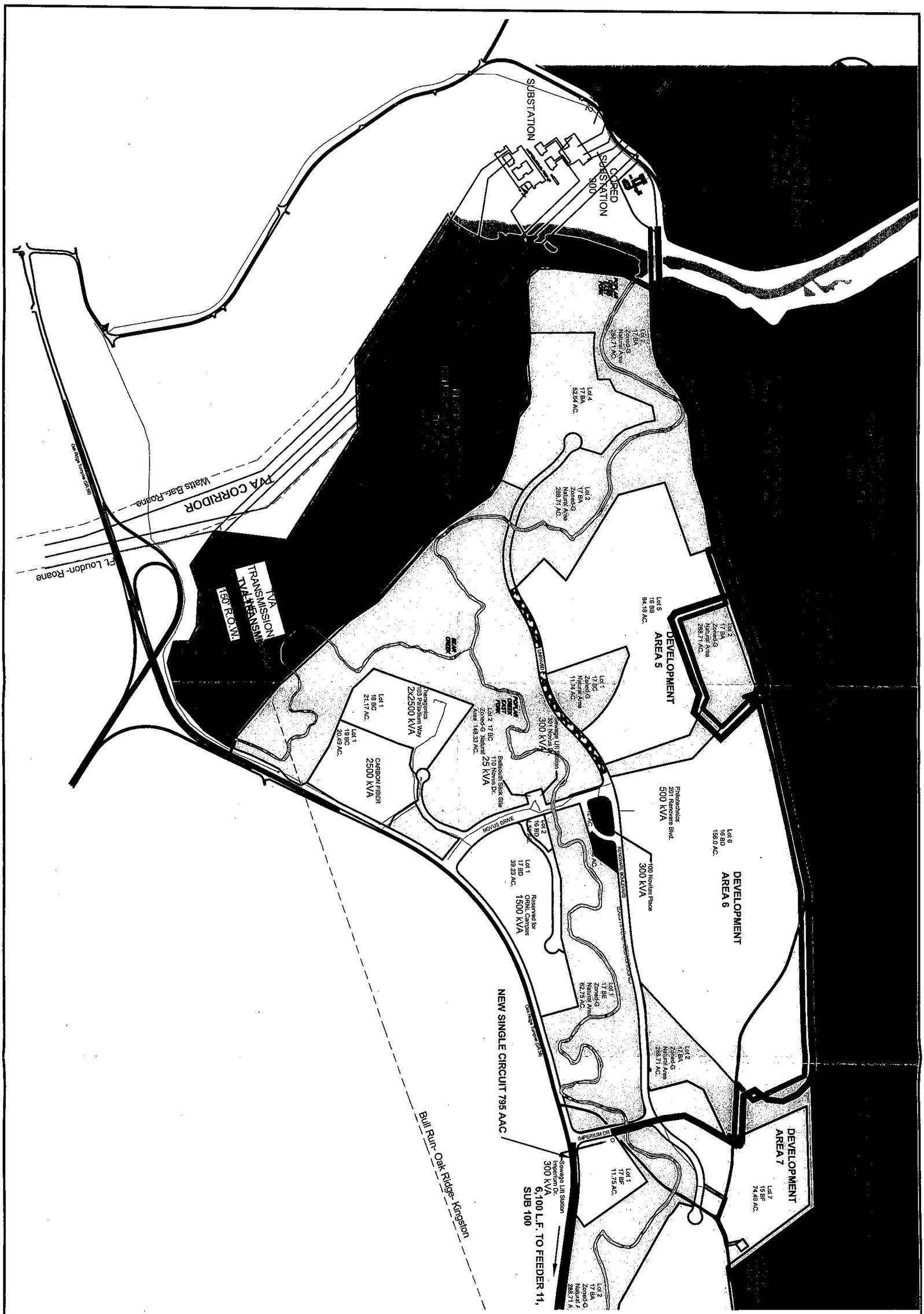
DATE	3-6-2013
SCALE	1"=1,200'
CCI PROJ. NO.	00975-0002

CITY OF OAK RIDGE
EXHIBIT 11
13 KV DUAL FEED

SHEET NO.
E1.11
JOB NO.
00975-0002



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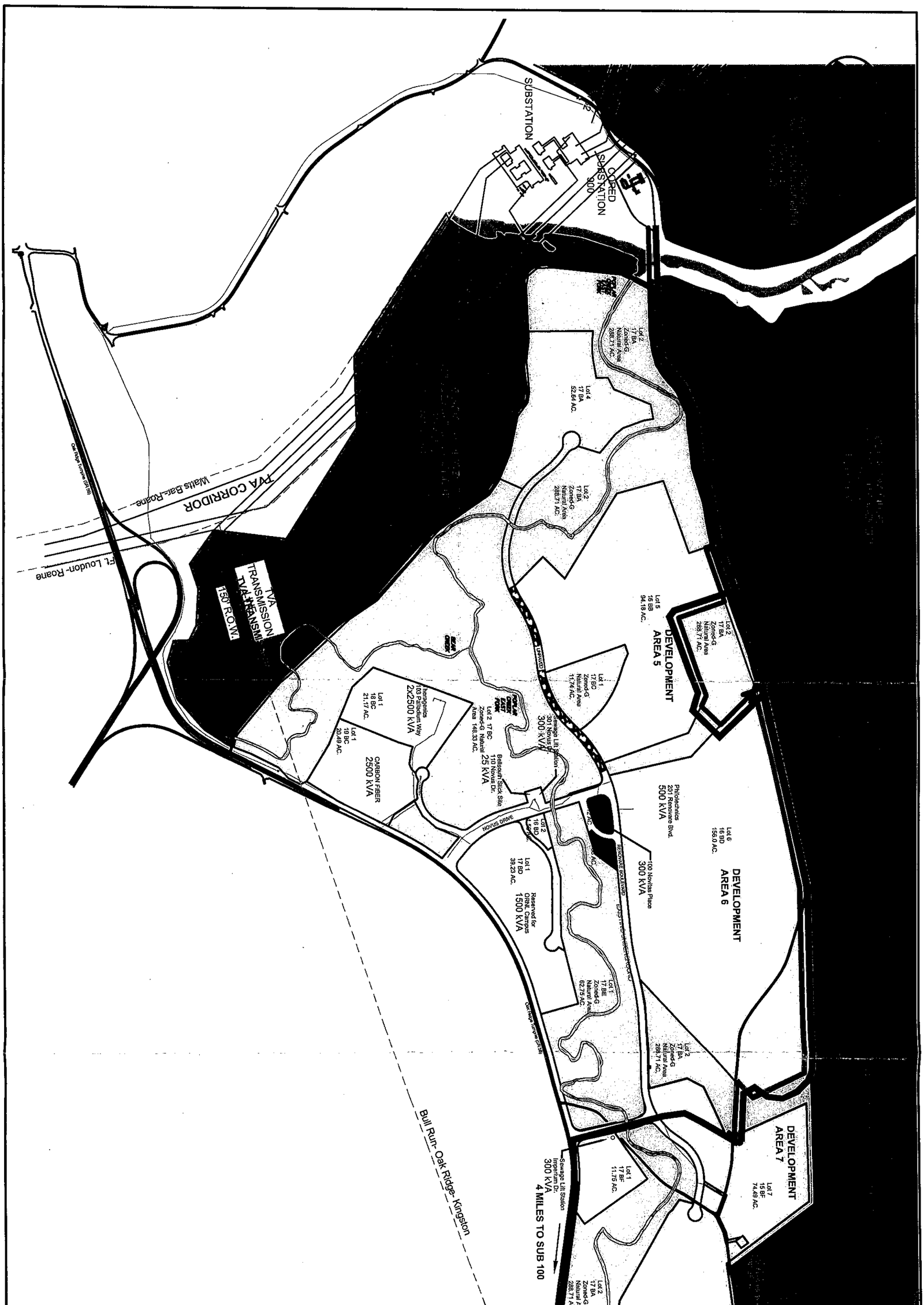
DRAWN BY	WBW
CHECKED BY	JLM
DATE	3-6-2013
SCALE	1"=1,200'
CCI PROJ. NO.	00975-0002

CITY OF OAK RIDGE
EXHIBIT 12
13 KV DUAL FEED

SHEET NO.
E1.12
JOB NO.
00975-0002



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SCALE	1"=1,200'
CCI PROJ. NO.	00975-0002

CITY OF OAK RIDGE
EXHIBIT 13
69 KV DUAL FEED

SHEET NO.
E1.13
JOB NO.
00975-0002