Appendix A: Existing Surface Infrastructure

PRELIMINARY INFRASTRUCTURE STUDY
PROPOSED DUSEL SITE
GILES COUNTY, VIRGINIA

Prepared for:

Kimballton Deep Underground Science and Engineering Laboratory
Kimballton DUSEL Team

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INTRODUCTION

The purpose of this site infrastructure study is to provide the Kimballton Deep Underground Science and Engineering Laboratory (DUSEL) Team with a document that summarizes information obtained in a preliminary infrastructure study. This study is based on preliminary information obtained to date in the project area and is intended as a guide for more detailed, subsequent infrastructure studies.

Draper Aden Associates completed a preliminary review of available infrastructure information for the proposed DUSEL portal locations at Kimballton, Hoges Chapel, and the Mountain Top Sites.

Draper Aden preformed the following tasks before beginning a site evaluation:

- Data Gathering – Gathered readily available information from Giles County: USGS and other topographic data, Virginia Base Mapping Program data, accessibility, utility availability, natural gas, and electric services.
- Field Reconnaissance – Conducted field investigations to identify points of interest, constraints, and assets of the site.

The information gathered in the tasks above is included in the attached appendix.

GENERAL SITE LOCATION INFORMATION

The proposed DUSEL site is located under Butt Mountain in Giles County, Virginia. It is located near the towns of Kimballton, Pembroke, Ripplemead, and Hoges Chapel. Access to the proposed site is attained via U.S. Route 460, a four-lane road which extends between Interstate 81 in Christiansburg, Virginia to Interstate 77 in Princeton, West Virginia. The proposed DUSEL location is approximately 27 miles west of I-81 on U.S. Route 460 West, approximately 18 miles beyond Virginia Polytechnic Institute and State University in Blacksburg, Virginia. The site is located approximately 33 miles east of I-77 in Princeton, West Virginia on U.S. Route 460 East. A vicinity map and the approximate portal locations can be found in Appendix A, Figures A1 and A2.

The location of the proposed portal locations in proximity to the Jefferson National Forest Area can be found in Appendix A, Figure A3. The general topographic features of the
study area consist of rolling hills, karst terrain and mountains, which is typical of areas located within the New River Valley of southwestern Virginia. The two portal sites are comprised of generally rolling hills with heavily forested areas interspersed with some clearings.

KIMBALLTON PORTAL SITE

The proposed Kimballton portal site is located on the north slope of Butt Mountain. The general location of the site in proximity to surrounding land features is located in Appendix B, Figure B1.

SITE LOCATION

The Kimballton portal site is located on the south side of State Route 628 approximately 5 miles north of the intersection of U.S. Route 460 and State Route 635. The portal is approximately three-tenths of a mile east of Chemical Lime Company’s Olean mining operation.

ACCESS

A general access road map is included in Appendix B, Figure B2.

Roads

U.S. Route 460 is a primary, four-lane highway connecting I-81 in Christiansburg and Blacksburg, Virginia with I-77 in Princeton, West Virginia. Route 635 is a secondary two-lane, state highway that connects the rural communities of Kimballton, Goldbond, and Olean to Route 460. This road currently accommodates heavy truck traffic to and from Chemical Lime’s mining operations at Kimballton and Olean. Route 628 is a local road surfaced with compacted gravel sufficient in width to accommodate construction traffic.

Rail Service

Norfolk Southern Railroad currently serves Chemical Lime’s Kimballton Mine operation. A siding is currently in place with capacity to accommodate approximately 15 rail cars. Norfolk Southern has indicated it has the infrastructure in place to provide service for DUSEL construction and operation. Specific available rail capacity will be determined by the amount of service required during construction and operation.
AVAILABLE UTILITIES

A general Kimballton Site map indicating existing and proposed utility information collected to date is included in Appendix B, Figure B3.

Water

The Giles County Board of Supervisors (GCBOS) and the Giles County Public Service Authority (GCPSA) provided a study of the existing water supply at the Kimballton site. The study was completed in order to determine the feasibility of extending existing water service from near U.S. Route 460 to residents of the State Route 635/Chemical Lime study area. This has been addressed in a Preliminary Engineering Report (PER) dated July 2004. The purpose of the PER was to identify, investigate and evaluate the alternative methods of extending public water service to the upper reaches of the State Route 635/Chemical Lime area of Giles County, Virginia. Preliminary project costs were developed for two alternatives, and conclusions were presented regarding selection of the recommended alternative.

The study area includes the environs adjacent to State Route 635 from approximately 1 mile north of the intersection of U.S. Route 460 and State Route 635 to the boundary of the Jefferson National Forest, approximately 0.6 mile north of the intersection of State Route 635 and State Route 628 (Olean Road). It was noted in the PER that residents above an elevation of 2,050 feet cannot be served by the existing GCPSA Riverbend and Bostic water storage tanks, which provide storage for the existing State Route 635 water distribution system.

Currently, the majority of the State Route 635/Chemical Lime Study area relies upon private wells and springs. However, there are two water distribution systems currently operating within the proposed study area: (1) the GCBOS State Route 635 system, and (2) the Chemical Lime Company’s private system.

The GCBOS system consists of a 6-inch water line, which is connected to the GCPSA water main along U.S. Route 460 and extends approximately 1 mile north of the intersection of U.S. Route 460 and State Route 635. The GCPSA Riverbend and Bostic water storage tanks supply this portion of the GCBOS water distribution system.
The Chemical Lime Company’s water distribution system consists of a spring, a 32,300-gallon concrete reservoir, chlorination equipment and various amounts of 3-inch and 4-inch water line necessary to service a maximum of 130 employees and 13 residential connections.

The existing GCBOS State Route 635 water system is supplied from a 2.0 million gallon per day (MGD) water treatment plant operated by the GCPSA. The GCPSA Water Treatment Plant is currently operating at approximately 60% of its capacity. The demands projected for the State Route 635/Chemical Lime study area will result in the GCPSA Water Treatment Plant operating at approximately 63% of its current capacity. Additionally, the Riverbend and Bostic water storage tanks provide storage capacity for this portion of the water distribution system, and water is transferred to the tanks from the GCPSA water treatment plant through the Bluff City and Wal-Mart pump stations.

Two alternatives were reviewed for the PER as follows:

**Alternative I**

In this alternative, a proposed water main would bypass the high point along State Route 635 by connecting to the County’s existing State Route 635 water system approximately 0.65 mile north of the intersection of U.S. Route 460 and State Route 635, paralleling the existing 6-inch water line to the intersection of State Route 626 (Klotz Road). The proposed line would extend northwest along State Route 626 to State Route 684 (Norcross Road), then run northeast to State Route 635 near Kimballton, and then parallel State Route 635 to the limits of the project area. Existing tanks would provide the necessary storage capacity for this alternative.

Preliminary cost estimates for this alternative detail a total project cost of approximately 2.41 million dollars. It is anticipated that this alternative may not provide adequate service to the proposed Kimballton DUSEL site due to the proposed elevation at the surface of approximately 2,050 feet at the site location.

**Alternative II**

In this alternative, a proposed water main would connect to the County’s existing State Route 635 water system approximately 1 mile north of the intersection of U.S. Route 460 and State Route 635. From this point the proposed line would extend north along State Route 635 to the limits of the project area at a location approximately 1 mile from the intersection of State Routes 635 and 626. Routing of the water main along the higher elevations of the service area
would require the construction of a water storage tank at an elevation greater than that of the GCPSA Riverbend and Bostic tanks, as well as the addition of a booster pump to supply water to the new storage tank.

Preliminary cost estimates for this alternative detail a total project cost of approximately 2.6 million dollars. Depending on the elevation of the proposed 100,000-gallon storage tank and required anticipated future demand for this study area, this alternative will likely provide adequate service to the proposed Kimballton DUSEL site.

A recommendation was provided in the PER to proceed with Alternative I due to the needs and relative cost of the project. Upon discussions with Giles County officials, other means for service can be investigated, such as Alternative II, in the event that a need for additional service is anticipated in this study area, particularly the development of the DUSEL site. Alternative I is scheduled to begin construction in Spring 2006.

**Sewer**

The nearest known service provider for sewer lies approximately 1 mile outside the Town of Pembroke and approximately 8 miles from the proposed Kimballton Site. A 10-inch gravity main located at Pembroke Street and U.S. Route 460 in Pembroke provides this service. Currently, the Kimballton Mine uses a septic and treatment system to treat its waste material.

**Electric**

Electric service is available to the site, however existing lines are not immediately adjacent to the site. American Electric Power (AEP) will charge for extending that service based on the potential usage of the services.

Existing 3-phase electric service is available from AEP at the Chemical Lime Mine approximately 0.25 mile from the proposed site. AEP has the capacity to serve the project at the proposed site location (Goldbond area / Butt Mountain). Assuming a 9MW load, the two possible service scenarios are outlined below and include the initial pro-forma cost estimates for serving the Kimballton project DUSEL site:
Improvements to Existing Sub-Station

The improvements required to serve the proposed load from the existing 34.5 KV distribution source and provide 34.5 KV delivery will cost approximately $250,000. The estimate could be higher if a separate breaker and circuit originating out of the existing Kimballton Station are required.

Construction of New Sub-Station

The approximate cost to provide a 138 KV tap and a 138/34.5 KV substation on site is approximately $4,000,000. This estimate is based on wood pole construction and would be higher if steel poles or towers are used. Cost estimates were determined using 34.5 KV to be consistent with the existing distribution system, which is somewhat flexible. If the load estimate increases, this may become the best choice, and alternatives will need to be reviewed as the project evolves in order to present the most advantageous response to the project needs. The advantage of this type of system is the significant increase in reliability, greater service range, and increased redundancy as the main power source to the facility.

Once KW demand and KWH / month load information is obtained, AEP will be better able to determine more accurate development costs that would then be relayed to the project developer.

Telecommunications

Pembroke Telephone Cooperative (PTC) provides telephone, internet, and cable television service to the area. Discussions with PTC have revealed that service availability can only be determined after a customer makes a formal request for service to identify their needs. It has been determined that PTC has an existing size 12 fiber optic cable extending along State Route 635 to the Chemical Lime facility. Representatives from PTC have indicated that adequate service can be provided to the proposed Kimballton site. The level of upgrades, if needed, and the associated cost would depend upon the anticipated use for the facility. Currently, PTC has indicated that there are approximately 3 fibers available for use.

Gas

There is currently not a gas provider in the area.
HOGES CHAPEL PORTAL SITE

The proposed Hoges Chapel portal site is located on the south slope of Butt Mountain. The general location of the site in proximity to surrounding land features is shown in Appendix C, Figure C1.

Site Location

The Hoges Chapel portal site is located on the north side of U.S. Route 460 approximately 3 miles east of the Town of Pembroke, Virginia and approximately 18 miles west of the Virginia Tech campus in Blacksburg, Virginia. This site is a portion of the property currently under consideration for a proposed Giles County Industrial Park.

Access

A general access road map is included in Appendix C, Figure C2.

Roads

Hoges Chapel Portal will be accessed directly from U.S. Route 460, a four-lane primary highway. A right deceleration and turn lane would be required to be constructed to the Virginia Department of Transportation (VDOT) standards. The proposed commercial entrance would be constructed at the current entrance to the Giles County Industrial Park. It is not anticipated that sight distance issues at this location would preclude the construction of one or more entrances to the proposed site.

An access drive alignment following an appropriate and efficient route from the proposed site entrance on U.S. Route 460 to the portal site produces an access drive of approximately 2,400 linear feet in length.

AVAILABLE UTILITIES

A general Hoges Chapel Site map indicating existing and proposed utility information collected to date is included in Appendix C, Figure C3.

Water
A study of the existing water supply at the Hoges Chapel site was investigated. General information was provided by Giles County in regard to existing water lines in the service area. Currently, the site is serviceable via an existing 8-inch water line that parallels U.S. Route 460. Representatives from Giles County have indicated that the service to the proposed Hoges Chapel site is adequate from this location, with appropriate upgrades to the system to accommodate growth from the proposed development.

**Sewer**

The nearest known provider for the sewer service is the Giles County Board of Supervisors (GCBOS). An existing 14-inch gravity sewer line lies approximately 0.5 mile outside the Town of Pembroke, approximately 1.5 miles from the proposed site location.

GCBOS received approval on June 26, 2000 from the Department of Environmental Quality (DEQ) for the Eastern U.S. Route 460 Corridor Sewer System Extension, based on a Preliminary Engineering Report (PER) dated June 2000. This report outlined the preliminary design for a regional sewer expansion from the existing Pembroke service area to Newport, Virginia. Phase I of the preliminary design includes the addition of service to the Giles County Industrial Park lying adjacent to Eastern Elementary / Middle School, which also includes the Hoges Chapel DUSEL Site. Currently, sewerage treatment for the Eastern Elementary / Middle School area is provided by a septic and treatment system. Upon completion of Phase I of the sewer system extension by the GCBOS, it is anticipated based on preliminary design efforts that the capability to provide sewer service to both the proposed Hoges Chapel DUSEL Site and Eastern Elementary / Middle school will be in place.

**Electric**

Electric service is available to the site, however existing lines are not immediately adjacent to the site. American Electric Power (AEP) will charge for extending that service based on the potential usage of the services.

Existing 3-phase electric service is available from AEP on U.S. Route 460. AEP has the capacity to serve the project at the proposed Hoges Chapel site location. Assuming a 9MW load, the two possible service scenarios are outlined below and include the initial pro-forma cost estimates for serving the Kimballton project DUSEL site:
Improvements to Existing Sub-Station

The improvements required to serve the proposed load from an existing 34.5KV distribution source and provide 34.5KV delivery will cost approximately $250,000. The estimate could be higher if a separate substation, breaker and circuit are required.

Construction of New Sub-Station

The approximate cost to provide a 138 KV tap and a 138/34.5 KV substation on site is $4,000,000. This estimate is based on wood pole construction and would be higher if steel poles or towers are used. Cost estimates were determined using 34.5 KV to be consistent with the existing distribution system, which is somewhat flexible. If the load estimate increases, this may become the best choice, and alternatives will need to be reviewed as the project evolves in order to present the most advantageous response to the project needs. The advantage of this type of system is the significant increase in reliability, greater service range, and increased redundancy as the main power source to the facility.

Once KW demand and KWH / month load information is obtained, AEP will be better able to determine the more accurate development costs that would be the relayed to the project developer.

Telecommunications

Pembroke Telephone Cooperative (PTC) provides telephone, internet, and cable television service to the area. Discussions with PTC have revealed that service availability can only be determined after a customer makes a formal request for service to identify their needs. It has been determined that PTC has an existing size 24 fiber optic cable extending along U.S. Route 460 to the Eastern Elementary / Middle School. Representatives from PTC have indicated that adequate service can be provided to the proposed Hoges Chapel site. The level of upgrades, if needed, and the associated cost would depend upon the anticipated use for the facility.

Gas

There is currently not a gas provider in the area.
MOUNTAIN TOP SITE

The proposed Mountain Top Site is located on the top of Butt Mountain. The general location of the site in proximity to surrounding land features is shown in Appendix D, Figure D1.

SITE LOCATION

The Mountain Top Tower is an out of service National Forest Service fire tower located in the north-central portion of Giles County. At an elevation of 4,200 feet above sea level, the Mountain Top Site rises approximately 2,600 feet above the New River at Ripplemead, Virginia.

ACCESS

A general access road map is included in Appendix D, Figure D2.

Roads

The Mountain Top Site is accessed by way of state secondary roads and National Forest Service roads. Approximately 1 mile west of the Hoges Chapel Portal entrance on U.S. Route 460, State Route 613 (Doe Creek Road) is a paved road constructed to secondary highway standards. Route 613 gains approximately 1,250 feet in elevation (to about 3,300 feet above sea level) over the 3.7 miles traveled to State Route 714.

State Route 714 is a compacted gravel road that is 13 feet wide with 3-foot wide shoulders on the cut side and 5-foot wide shoulders on the fill side. This road continues for 2.8 miles at which point state maintenance ends in the vicinity of Little Stony Creek. Along the way, Route 714 first climbs to an elevation of 3,600 feet above sea level, then descends to 3,050 feet at Little Stony Creek.

From the end of Route 714, a National Forest Service road (shown as Butt Mountain Road on Forest Service maps) crosses Little Stony Creek by way of a concrete bridge and begins the 1,150 foot climb over 4.4 miles to the Mountain Top Tower at elevation 4,200 feet above sea level. Butt Mountain Road is an “open” loose-gravel road that varies in width from 10-feet wide with 3-foot shoulders, to 12-feet wide with 2-foot shoulders. The road conditions are generally fair to good with isolated portions of extremely rutted segments requiring high-clearance vehicles and, in wet weather conditions, 4-wheel drive vehicles.
AVAILABLE UTILITIES

A general Mountain Top Site map indicating existing and proposed utility information collected to date is included in Appendix D, Figure D3.

Water

A study of the existing water supply at the Mountain Top Site was investigated. General information was provided by Giles County in regard to water lines that exist in the service area. The site is not serviceable by an existing potable water system. It is anticipated that service can be provided via a well and storage system.

Sewer

A study of the existing sewer system at the Mountain Top Site was investigated. General information was provided by Giles County in regard to sewer lines that exist in the service area. The site is not serviceable by an existing sewer system without significant upgrades to the existing system. It is anticipated that service can be provided by an on-site septic system, or other means, depending on demand.

Electric

Existing single-phase electric service is available from AEP near the existing fire tower location at the Mountain Top Site. Existing power easements can be incorporated, or built upon, in order to provide the service necessary. AEP has the capacity to serve the project at the proposed site location, assuming a 9MW load. Once KW demand and KWH / month load information is obtained, AEP will be better able to determine the more accurate development costs that would be then relayed to the project developer.
**Telecommunications**

Pembroke Telephone Cooperative (PTC) provides telephone, internet, and cable television service to the area. Discussions with PTC have revealed that service availability can only be determined after a customer makes a formal request for service to identify their needs. It has been determined that PTC has an existing fiber optic cable in the project area. Representatives from PTC have indicated that adequate service can be provided to the proposed Mountain Top site with new construction of additional fiber optic cable depending upon the required demand for the facility. The level of upgrades, if needed, and the associated cost would depend upon the anticipated use for the facility.

**Gas**

There is currently not a gas provider in the area.

**SUMMARY**

In summary, it is anticipated at this time that all three sites can be serviced with adequate utility needs. Items to note:

- The Kimballton, Hoges Chapel, and Mountain Top Sites can be serviced via a highly reliable 138 KV power source at a very reasonable cost due to the close proximity of the existing transmission line.
- The Kimballton, Hoges Chapel, and Mountain Top Sites can be serviced with phone, internet, and cable television via an existing fiber optic cable in the near vicinity to each site.
- The Kimballton site may be serviceable from a community water source based on an existing Preliminary Engineering Report with upgrades to the proposed preliminary design. The Hoges Chapel Site may be serviceable with upgrades to existing community water systems lines in the near vicinity as well.
- The Hoges Chapel Site is serviceable with construction of proposed Phase I of the Preliminary Engineering Report as approved for design of a regional sewer system.
- Further discussions and confirmation with Giles County officials is warranted to ascertain the schedule for water system upgrades and the feasibility in proceeding with proposed water system Alternative II to plan for possible future DUSEL developments.
• Further investigation is recommended to determine the available capacity of the surrounding town’s sanitary sewer systems and to discuss possible plans for future expansion.

• Once potential usage levels are established, demand information should be forwarded to water, sewer, gas, electric and high-speed broadband providers to confirm appropriate availability.

REFERENCES


• Virginia Base Mapping Program of Montgomery County State of Virginia dated 2002.

Figure A3

Kimballton Portal Overview Map

Limits of Jefferson National Forest

Proposed Mountain Top Site

Proposed Kimballton Portal

Proposed Hoges Chapel Portal

New River

635

613

18 Miles to Va Tech.

0 1 2 Miles

National Forest boundary from USFS GIS website.
USGS 7.5' Topographic Maps: Lindside, Pearisburg, Interior, Eggleston
APPENDIX B

Kimballton Site Maps
Kimballton Portal Area Map

Figure B1

Aerial Imagery Copyright 2002 Commonwealth of Virginia
Kimballton Portal Access Map

Approximate Site Access Location

Approximate Location of Proposed Kimballton Portal

Existing Rail Service

Existing Kimballton Mine

Approximate Boundary of Mine Property

National Forest boundary from USFS GIS website. USGS 7.5' Topographic Maps: Lindside, Pearisburg. Parcel Information provided by Giles County.
Approximate Location of Proposed Kimballton Portal

Proposed 8" Water Line

Existing Fiber-Optic Line

Existing 138 kV and 345 kV Transmission Lines

Fiber Optic
Electric
Water - Proposed

Utility Information provided by Giles County.
Fiber optic information provided by Pembroke Telephone Co-op.

Figure B3
APPENDIX C

Hoges Chapel Site Maps
Approximate Location of Proposed Hoges Chapel Portal

Figure C1

Aerial Imagery Copyright 2002 Commonwealth of Virginia
Hoges Chapel Portal Access Map

Approximate Location of Proposed Hoges Chapel Portal

Approximate Site Access Location

Approximate Boundary of J. Moore Property

Eastern Elementary School

613

460

USGS 7.5’ Topographic Maps: Eggleston.
Parcel Information provided by Giles County.

Figure C2
Hoges Chapel Portal Utilities Map

- Existing 138 kV Transmission Line
- Existing Fiber-Optic Line
- Existing Water Line
- Proposed Sewer Line
- Approximate Location of Proposed Hoges Chapel Portal

Utility Information provided by Giles County.
Fiber optic information provided by Pembroke Telephone Co-op.
APPENDIX D

Mountain Top Site Maps
Mountain Top Site Area Map

Approximate Location of Proposed Mountain Top Site

Forest Service Fire Lookout Tower

National Forest Boundary

Figure D1

Aerial Imagery Copyright 2002 Commonwealth of Virginia
Figure D2

Mountain Top Site Utilities Map

Approximate Location of Proposed Mountain Top Site

- Existing Telephone and Electrical Line
- Existing 345 kV Transmission Lines
- Existing 138 kV Transmission Lines
- Existing Fiber-Optic Line

8 Miles to Hoges Chapel

National Forest Boundary

0 2,000 4,000 Feet

Utility Information provided by Giles County.
Fiber optic information provided by Pembroke Telephone Co-op.