Report
Preliminary Geotechnical Engineering Services
Red Ridge 3,000-Acre Development
Valley County, Idaho
File No. 15835-008-00

January 7, 2008

Prepared for:

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Attention: James Fronk, LA

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PRELIMINARY GEOTECHNICAL ENGINEERING SERVICES
RED RIDGE 3,000-ACRE DEVELOPMENT
VALLEY COUNTY, IDAHO
FOR
SECESH ENGINEERING, INC.

INTRODUCTION

GeoEngineers is pleased to present our preliminary geotechnical engineering services report for the proposed approximate 3,000-acre Red Ridge Development. The subject site is located southwest of Payette Lake, west of West Mountain Road near McCall, Idaho, approximately as shown in the Vicinity Map, Figure 1. The subject development is more specifically located in portions of Sections 26, 34, and 35 of Township 18 North, Range 2 East, and portions of Sections 2, 3, 10, 11, 14, 15, 22, and 23, Township 17 North, Range 2 East.

We understand that the site will be subdivided into lots for single-family residential development. The project will include site grading, infrastructure and road construction. Site grading information was not provided at the time we prepared this report, though earthwork is contemplated on relatively steep hillsides and for road construction. Minimal lot grading is contemplated. Water service is expected to be from a community well, and municipal sewer service is anticipated for the subject development.

SCOPE OF SERVICES

Our services have been performed in general accordance with our proposal dated November 3, 2006. Our study was authorized by you on November 9, 2006.

The purpose of our services was to provide preliminary level geotechnical recommendations and to evaluate the effect of geologic conditions on the proposed development based on subsurface conditions encountered in our explorations. This report is intended to provide preliminary geotechnical engineering recommendations for development of the site and identify areas where further investigation might be warranted, depending on road locations, depth of cuts and height of fills, and necessity for retaining structures. We completed the following specific scope of services:

1. Reviewed available in-house literature and wetlands information provided by Secesh Engineering, Inc. (Secesh) to evaluate and identify geologic features of potential interest, including, but not limited to, springs and steep slopes. Additional literature review focused on area geology in general.
2. Explored the soil and groundwater conditions in the proposed development area by excavating a series of 34 test pits with a backhoe subcontracted to Secesh.
3. Installed piezometers to monitor groundwater in 33 test pit locations. We measured the groundwater in these piezometers after installation.
4. Evaluated the pertinent physical characteristics of the soil in our laboratory by completing tests on selected samples.
5. Provided an estimate of the seasonal high groundwater level and allowable infiltration rates at each test pit location.
6. Provided earthwork recommendations including subgrade preparation, general rippability, structural fill placement, and use of on-site soils as structural fill or utility trench backfill.

from residuum of granite. Presumptive soil properties of the soils encountered and anticipated soils at the site based on SCS data are presented in Table 1 below.

Table 1. Soil Properties

Soil Properties	Unified Soil Classification Group	Map Unit Number	Surface Runoff	Water Permeability	Erodibility	Shrink-swell Potential
Archabal loam, 4 to 12 percent slopes	CL, CL-ML, SM, SP-SM	3	Medium	Moderate to rapid	Slight to moderate	Low to moderate
Blackwell clay loam	CL-ML, CL, SC, SM-SC	5	Slow	Moderately slow	None to slight	Low to moderate
Bluebell cobbly loam	SC, GC	8	Medium to rapid	Moderately slow	Moderate to severe	Low
Bryan-Ligget complex, 40 to 60 percent slopes	SM, SP, SP-SM	10	Very rapid	Moderately to very rapid	Severe to very severe	Low
Cabarton silty clay loam	CL, CH	12	Slow	Slow	None to slight	Moderate to high
Demast loam	CL-ML, CL	15	Rapid to very rapid	Moderately slow	Severe to very severe	Low to moderate
Jugson coarse sandy loam, 5 to 30 percent slopes	SM, SP-SM	25	Medium	Moderately rapid to rapid	Moderate to severe	Low
McCall complex, 5 to 50 percent slopes	SM, SP	31	Medium to very rapid	Moderately rapid to rapid	Moderate to very severe	Low
Nisula loam, 4 to 12 percent slopes	ML, CL, SC	37	Medium	Moderately slow	Slight to moderate	Low to moderate
Nisula loam, 12 to 20 percent slopes	ML, CL, SC	38	Medium	Moderately slow	Moderate	Low to moderate
Nisula loam, 30 to 60 percent slopes	ML, CL, SC	39	Very rapid	Moderately slow	Severe to very severe	Low to moderate
Sudduth Variant loam	ML, CL, CH	53	Slow to medium	Slow	Slight to moderate	Low to high
Tica very cobbly loam	GM-GC, GC, CL, CH	58	Medium to very rapid	Slow	Moderate to very severe	Low to high
Quartzburg-Bryan complex	SM, SP, SP-SM, SM, GP, GP-GM, GM	43	Medium to rapid	Rapid	Moderate to severe	Low

Layers of predominately sandy soils were encountered in a few other test pits. These sandy soils can be characterized as having low compressibility, low to moderate permeability, and moderate to high strength in place.

Gravelly soils were encountered in numerous test pits. These soils were decomposed or weathered basalt, contained cobbles and boulders, and were clayey in most of the test pits. The gravel soils can be characterized as having low to moderate compressibility, low to high permeability, and moderate to high strength in place.

Fine-grained soils consisting of silt and lean to fat clay were encountered in the majority of the test pits. These soils were predominately stiff to very stiff, moist to wet and contained basalt gravel, cobbles and boulders in many test pits. These fine-grained soils can be characterized as having low to moderate compressibility, low to high expansion potential, low to moderate permeability, and low to moderate strength in place.

Six of the test pits were terminated at relatively shallow depths due to refusal on basalt. In some of these test pits, a few feet of the basalt were excavatable with the trackhoe prior to refusal.

We installed piezometers in 33 of the test pits, in order to monitor groundwater levels. We returned to the site and measured the depth to groundwater in our piezometers on November 17, 2006. We did not encounter water in any of our test pits at the time of excavation. Groundwater level measurements, where groundwater was encountered, are presented in Table 2 below.

Table 2. Groundwater Measurements

Test Pit	Measured Groundwater Depth November 17, 2006 (feet)
TP-10	7.7
TP-11	5.8
TP-15	7.7
TP-16	8.9
TP-18	8.6
TP-32	8.1

Groundwater levels should be expected to seasonally fluctuate as a function of, precipitation, irrigation, snowmelt and other factors.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

We conclude that the proposed project is feasible with respect to the geotechnical conditions encountered in our explorations. The majority of the eastern and northern portions of this site are suitable for development. Slopes in these areas are inclined at less than 3H:1V and should require minor modification and stabilization for development. The majority of the western and southern portions of this site are characterized by slopes which are steeper than 3H:1V. Specific recommendations for development of and construction on these areas cannot be formulated until details regarding proposed final site grades for development. These areas are illustrated on Figure 3.

require excavation of the existing fill and replacement with structural fill, conforming to criteria contained in the subsequent sections of this report.

Because grading plans have not been finalized, it is unknown if fill will be placed in the lower elevations of this site. However, we anticipate site grading for roads and building pad construction will be required to establish final site grades.

Retaining structures will likely be required to retain both cuts and fills. The type, size and location of retaining structures were not available at the time we prepared this report. Lateral earth pressures for design of retaining walls will be dependent upon a number of factors, including backslope inclination, drainage, and soil type. Geotechnical design parameters also will depend on the types of retaining structures selected for use at the site. Based on results of our study, we believe that mechanically stabilized earth, soil-nail, and gravity and tied-back soldier pile retaining walls are feasible for the subject development.

We understand areas of groundwater seepage exist and have been mapped by Secesh Engineering. Groundwater seepage and shallow groundwater flow areas may become unstable when disturbed. Areas within natural drainage ways should not be developed nor disturbed. Due to the thick vegetation present at this site, snow cover, the scope of our work, size of the site and slope inclinations, we did not identify areas where groundwater and surface water conditions should be considered during design. Accordingly, we recommend that a geotechnical engineer from our office accompany the project civil engineer on a comprehensive site reconnaissance after initial road alignments are determined and staked. The purpose of such a reconnaissance will be to identify surface water courses and known or suspected areas of groundwater seepage that should be considered during preparation of final site grading plans and proposed road design.

Surface drainage should be designed for rapid removal of surface water and emerging groundwater from slope faces. See "Structural Fill – General" and "Suitability of On-Site Soil" for further recommendations.

Excavations will likely be in either the basalt residuum and colluvium encountered on the site, or into weathered or competent hard rock for cut slopes. Excavations in the harder rock may require blasting. A more detailed evaluation of bedrock rippability could be completed during the final geotechnical investigation by completing seismic refraction surveys. Excavation also will be necessary to bench into the hillside for fill placement on slopes steeper than 5H:1V. Rock encountered or observed at the site consisted of highly weathered to relatively unweathered basalt and weathered granite. Heavy-duty equipment will likely be required to develop this site. Bedrock may be encountered in isolated areas during grading and could require the use of blasting or sawing to remove.

The majority of soils excavated from our test pits are fine-grained, highly expansive clays. The Soil Survey of Valley Area, Idaho indicates the residuum of basalt and colluvium prevalent at this site has a shrink-swell potential ranging from low to high. Swell potential is variable with depth and location, and may be influenced by factors such as the initial moisture content of the soil, exposure of the soil to the weather, a moisture source such as ponding from poor grading around a building, irrigation, or vegetation cover, and the clay content of the soil itself. The shrink-swell volume changes within the clayey soil can cause detrimental differential movements of structural improvements (e.g. pavements, concrete slabs-on-grade, and foundation areas) constructed within their zone of influence. These soils should be removed below structural improvements in order to mitigate the potential distress if left in-place. At a minimum, surface drainage controls combined with other appropriate measure to control soil expansion or to isolate the proposed improvement from the effects of soil expansion should be developed and implemented.

As stated above, the slopes appear to be stable in their present configuration. In our opinion, the proposed development as described above should not adversely impact the stability of these slopes provided recommendations contained herein are reflected in the design and implemented during construction. The developer must be aware that there are inherent risks in construction on hillsides. Our recommendations are intended to reduce the potential for future property damage related to earth movements, drainage or erosion. However, all construction on or near slopes involves risk, only part of which can be mitigated through qualified engineering and construction practices. In our opinion, the risk of damage to proposed roads should be relatively low if the recommendations in this report are implemented. Particular care is necessary with respect to the recommendations for placing fill on sloping ground and drainage. Localized sloughing or raveling of surficial soils should be anticipated and could affect the roadways near the tops of the slopes. Periodic maintenance of both the fill and the natural slopes below the roadways may be required. Any small erosional features or slumps must be repaired promptly. A homeowners association or other mechanism should be established to maintain the slopes and proper drainage relative to the roadways.

The lot owners must also be made aware that there are inherent risks in owning a hillside house that the owner must assume. Localized sloughing or raveling of surficial soils should be anticipated and could affect the upland portions of the lots near the top of the slopes. It is our opinion that the proposed residential development should not significantly affect the stability of the slopes or adjacent properties, provided that: (1) no additional discharge of water occurs into the ground near or on the slope; (2) no surface or stormwater is discharged onto the slope; (3) no fill, yard waste or other material is placed on the slope or within the setback zone above the slope; (4) the vegetation is not removed and surface erosion from stormwater is prevented along the slope; and (5) any small erosional features or slumps are repaired promptly. Homeowners, or the homeowner's association, have the responsibility to maintain the slope and proper drainage.

SITE PREPARATION

The area to be developed should be stripped of all topsoil, vegetation, roots larger than ½-inch, and otherwise unsuitable material. Stripping depths are expected to range from about 6 to 12 inches in the higher elevation areas to 18 inches in the low lying areas. However, actual stripping depths should be determined by a representative from our staff at the time of site development. The stripped material should be wasted off-site or stockpiled and used for landscaping purposes if determined acceptable by the Owner. Soft sediments should be removed from drains and swales before filling. Where large boulders are removed, the void should be replaced with structural fill placed in accordance with the "Structural Fill" section below.

After stripping, roots larger than about ½ inch in diameter should be grubbed out. The site then should be proofrolled with a loaded dump truck or other heavy vehicle to identify soft, wet, unstable or other areas of unsuitable soil. Any soft, loose or otherwise unsuitable areas identified during proofrolling should be recompacted if practical or removed to a depth of about 2 feet or firm bearing, whichever is less, and replaced with structural fill. We recommend the proofrolling of the subgrade be observed by a representative of our firm to assess the adequacy of the subgrade conditions and to identify areas needing remedial work. We further recommend that this procedure not be performed during wet weather. If construction needs to continue during wet weather, it may be necessary to over-excavate disturbed material and place a layer of sand and gravel with less than 5 percent fines (silt- clay-sized soil particles passing the U.S. No. 200) to provide a working surface over moisture-sensitive soils. Areas of deeper, soft, wet, unstable subgrade that are encountered or created, may require the Contractor to over-excavate and stabilize the subgrade by placing an Engineer-approved geotextile and clean compacted granular fill

Structural fill placed on slopes steeper than 5H:1V should be benched and keyed into firm, undisturbed native soils or bedrock. Such benches should be about 8 feet wide or the width of equipment used to construct such benches, but not less than 6 feet. The height of the bench on the uphill side should be in the range of 1 to 3 feet.

We recommend that during fill placement, the work surface should be graded to direct runoff away from structural fill areas to reduce the potential saturation of the exposed surface of fill material or in-place soil during precipitation events. It is very difficult to properly moisture condition fill soils during freezing weather, and achieving adequate compaction if the fill is frozen is almost impossible. No frozen fill shall be placed and no fill shall be placed on frozen ground, upon standing water, or on yielding soil.

Fulltime earthwork monitoring and a sufficient number of in-place field density tests should be performed to evaluate fill placement and compaction operations and to confirm that the required compaction is being achieved.

Suitability of On-Site Soil

Clayey soils should not be used as structural fill material unless placed in the deeper portions of fill areas. These soils should be compacted at a moisture content between 0 and 3 percent above their optimum moisture content. They should not be permitted to dry-out or become desiccated at any time. These soils are moisture sensitive and can be difficult to compact if the moisture content is more than a few percent either wet or dry of optimum moisture content.

The soils on this site also consist of silt, sand, and gravel. Cobbles (rock 3 to 12 inches in diameter) and boulders (rock larger than 12-inches in size) are also prevalent in these soils. The fine-grained clay and silt soils, soils with majority content smaller than the U.S. No. 200 sieve, are moisture sensitive and will be difficult to compact if the moisture content is more than a few percent either wet or dry of optimum. Some of the soils may require drying out prior to fill placement. A majority of the soils present at the site are generally suitable for use as structural fill with exceptions as stated above, but the sand and gravel deposits are best suited for structural fill use. Cobbles and boulders larger than 4 inches in diameter should not be used in fills. If this is deemed necessary, we should be contacted to provide recommendations for placement of rocks in fill.

Imported Soil

Imported soil, if used as structural fill, should conform to the recommendations provided in the "General" section above. We suggest that the fines content be limited to about 30 percent and that the Plasticity Index of such fines be less than 10 for imported fill that will be placed during dry weather and on dry subgrades, provided that the moisture content is near optimum to obtain adequate compaction. If structural fill is placed during wet weather or will be reworked during wet weather, we recommend that select imported fill be used and consist of well-graded sand and gravel with a fines content limited to 5 percent based on that portion passing the 3/4-inch sieve.

PERMANENT SLOPES

We recommend a maximum permanent slope inclination of 2H:1V or flatter in the native soil or in structural fill placed in accordance with our recommendations. Fill should be carefully compacted on the slope face, or the fill embankment can be overbuilt and cut back to a 2H:1V or flatter configuration. Permanent slopes should be hydroseeded or otherwise protected from erosion. Temporary erosion control measures may be necessary until permanent vegetation is established.

downspouts be tightlined to the storm drainage system or other suitable discharge away from buildings. Leaves and other debris should be kept out of such drainage systems. The downspout drains should not be connected to footing or retaining wall drains. These recommendations are intended to reduce the possibility of water seeping into below-grade occupied spaces in structures.

RECOMMENDATIONS FOR FURTHER STUDY

The information contained in this report is considered preliminary in nature and should be used to assist in preliminary project planning and may be used for entitlement of the project. At this time, specific uses for the project are not known to us. We recommend a more detailed geotechnical study of the site be performed after more specific site planning has been completed.

LIMITATIONS

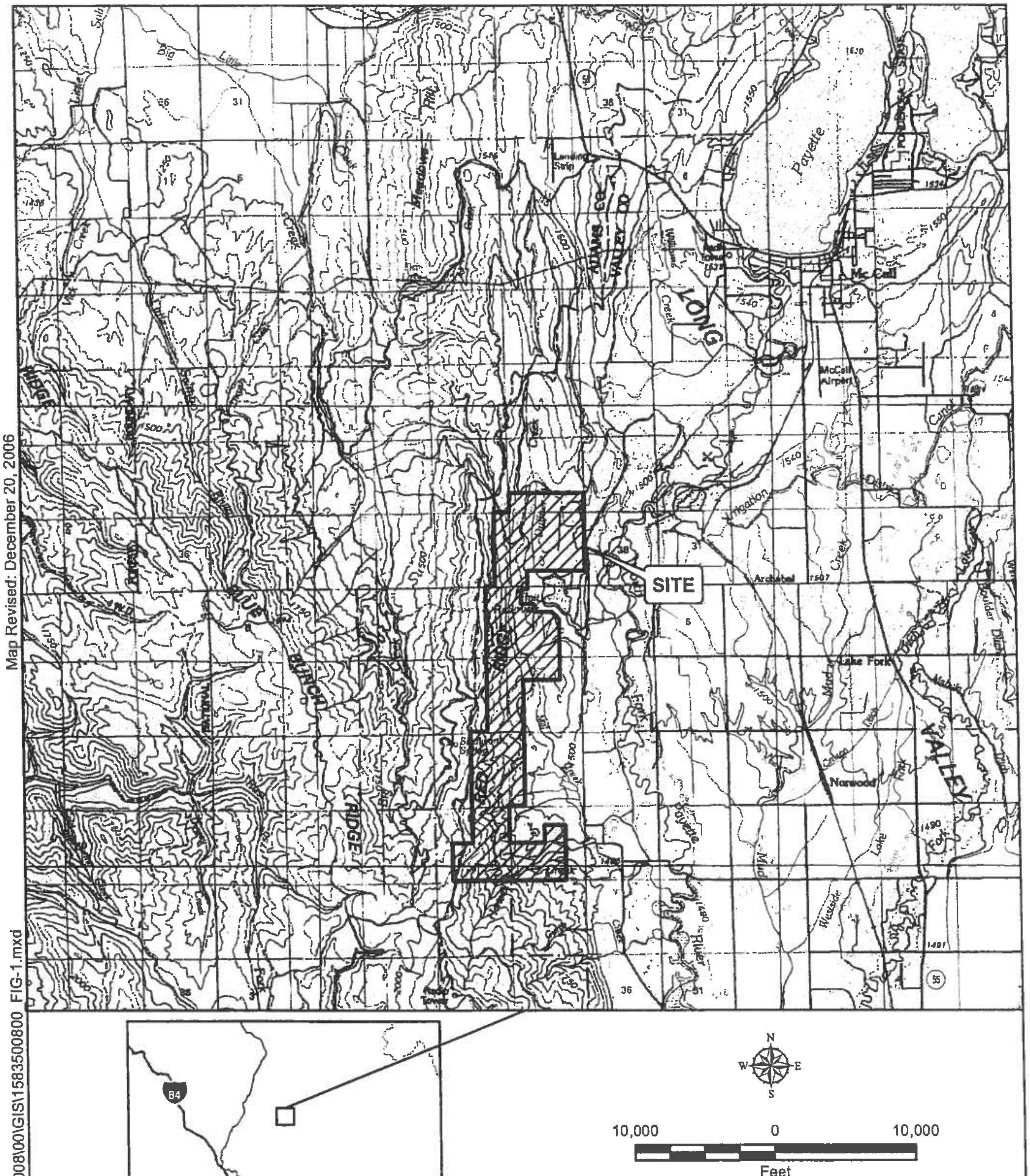
We have prepared this report for use by Secesh Engineering, Inc., and the rest of the design team for the proposed Red Ridge 3,000-Acre Development in Valley County, Idaho.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form or hard copy of this document (email, text, table, and/or figure), if provided, and any attachments are only a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information pertaining to the use of this report.

Map Revised: December 20, 2006



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Data Sources: Data are from the StreetMap USA.
USGS topo map provided by TerraServer (DRG-Scale4m).

NAD 1983 UTM Zone 11N

Vicinity Map

Red Ridge 3,000-Acre Project
Valley County, Idaho

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Figure 1

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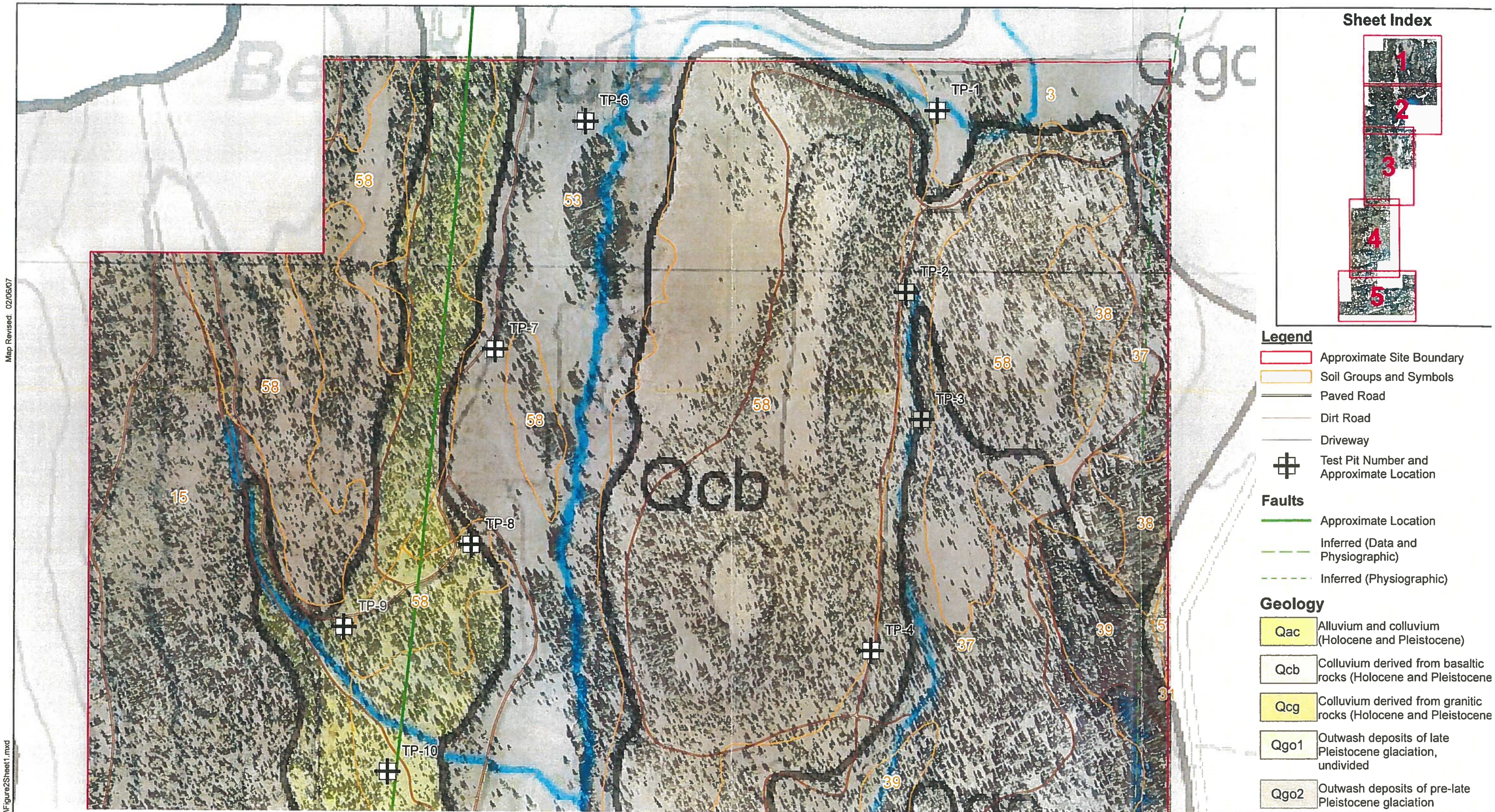

Boise Path: 15635008\00\GIS\Figure2Sheet1.mxd Map Revised: 02/06/07

Reference: 2004 aerial photos and topography obtained from Secesh Engineering on 11/25/06.
Digital Soil overlay for Valley County obtained from NRCS.
Overlay of "Surficial Geologic Map of Long Valley, Valley County, Idaho" dated 2006, obtained from Idaho Geological Survey.
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Site Plan

Red Ridge 3000-Acre Development
Valley County, Idaho

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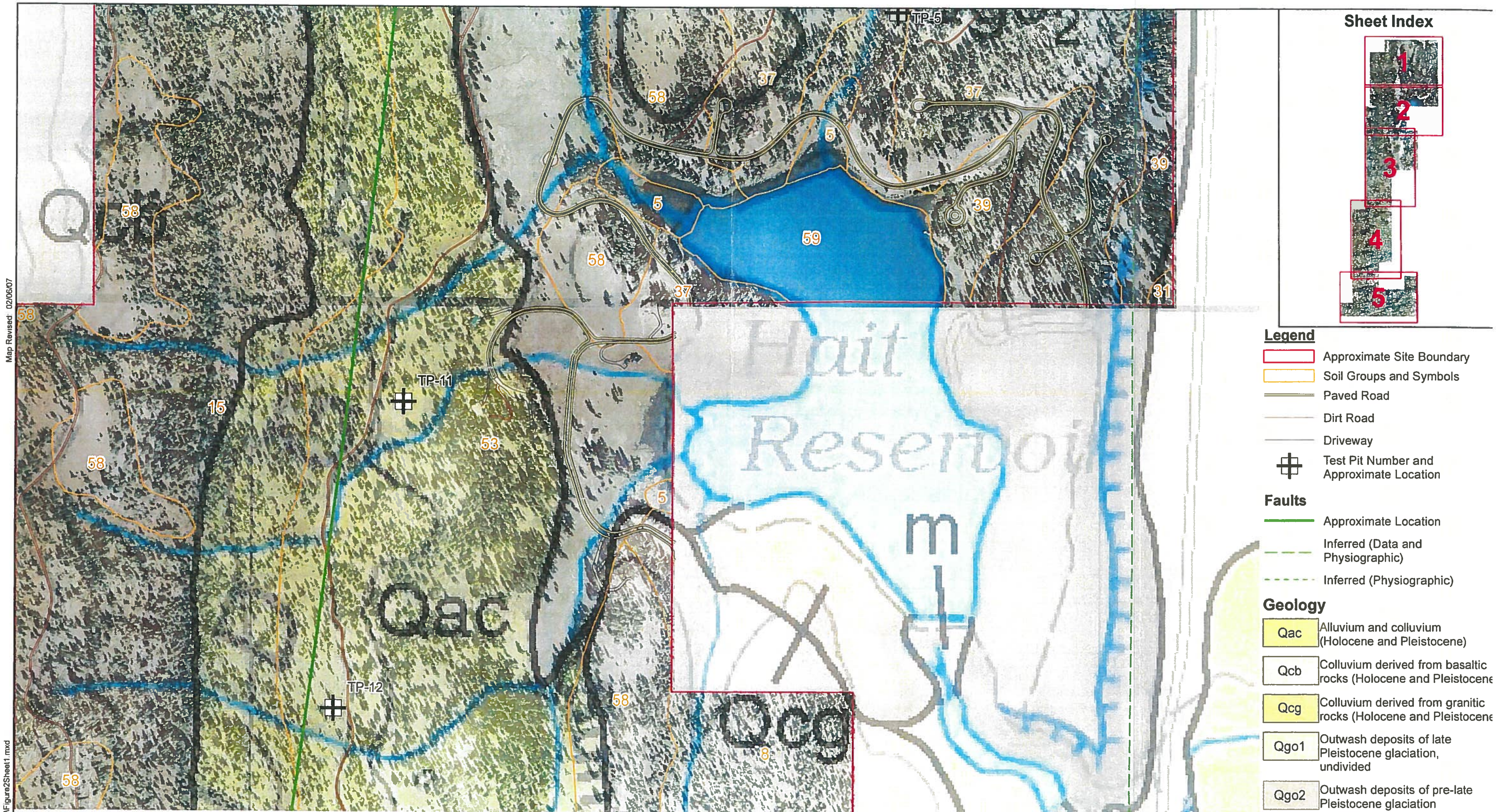
Figure 2
Sheet 1 of 5



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Site Plan

Red Ridge 3000-Acre Development
Valley County, Idaho

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Figure 2
Sheet 2 of 5

Map Revised: 02/06/07

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Boise

Legend

- Approximate Site Boundary
- Soil Groups and Symbols
- Paved Road
- Dirt Road
- Driveway
- Test Pit Number and Approximate Location

Faults

- Approximate Location
- Inferred (Data and Physiographic)
- Inferred (Physiographic)

Geology

Qac	Alluvium and colluvium (Holocene and Pleistocene)
Qcb	Colluvium derived from basaltic rocks (Holocene and Pleistocene
Qcg	Colluvium derived from granitic rocks (Holocene and Pleistocene
Qgo1	Outwash deposits of late Pleistocene glaciation, undivided
Qgo2	Outwash deposits of pre-late Pleistocene glaciation

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Site Plan

Red Ridge 3000-Acre Development
Valley County, Idaho

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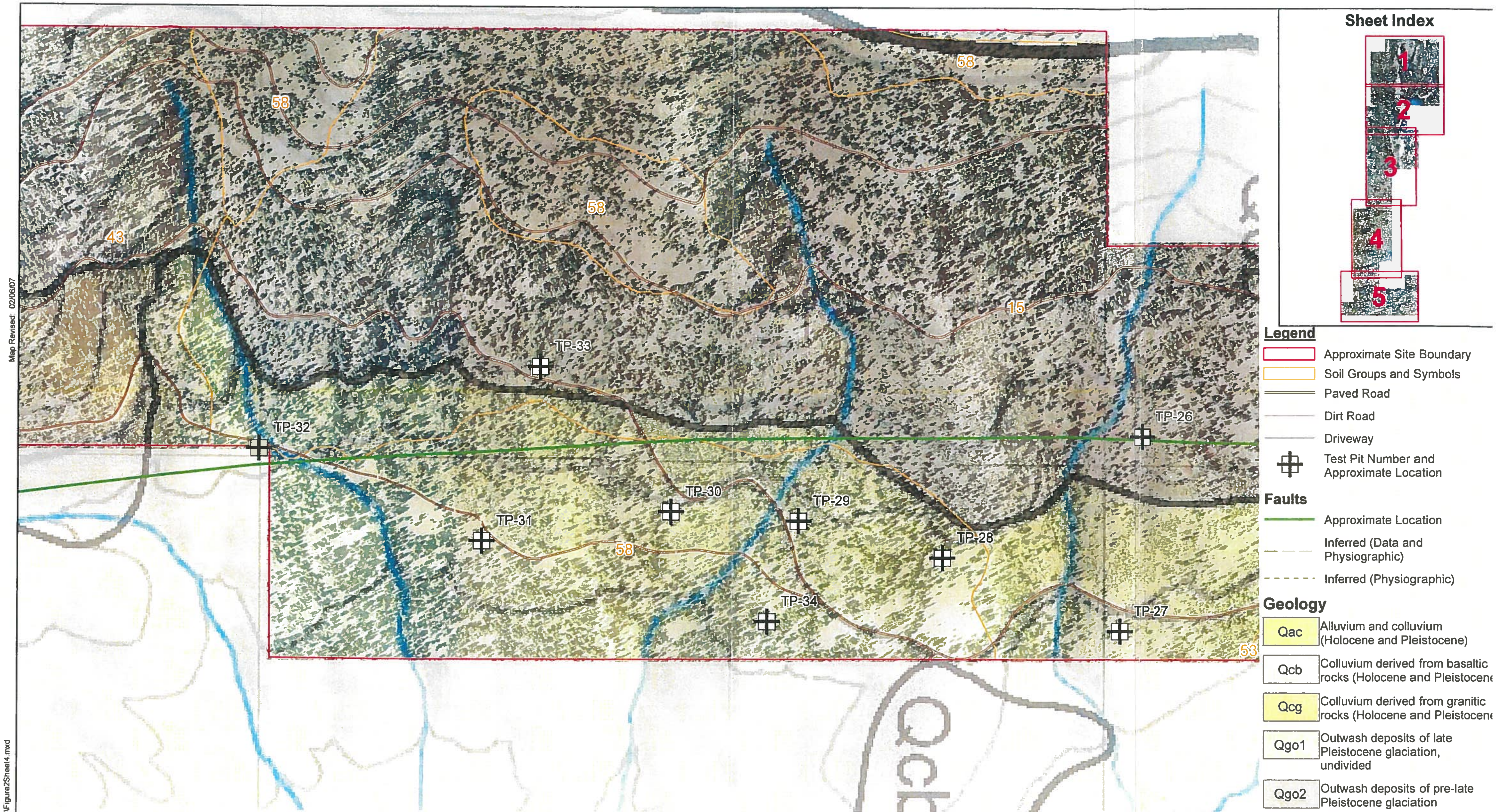
Figure 2
Sheet 3 of 5



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700 0 700
Feet

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Site Plan

Red Ridge 3000-Acre Development
Valley County, Idaho

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Figure 2
Sheet 4 of 5

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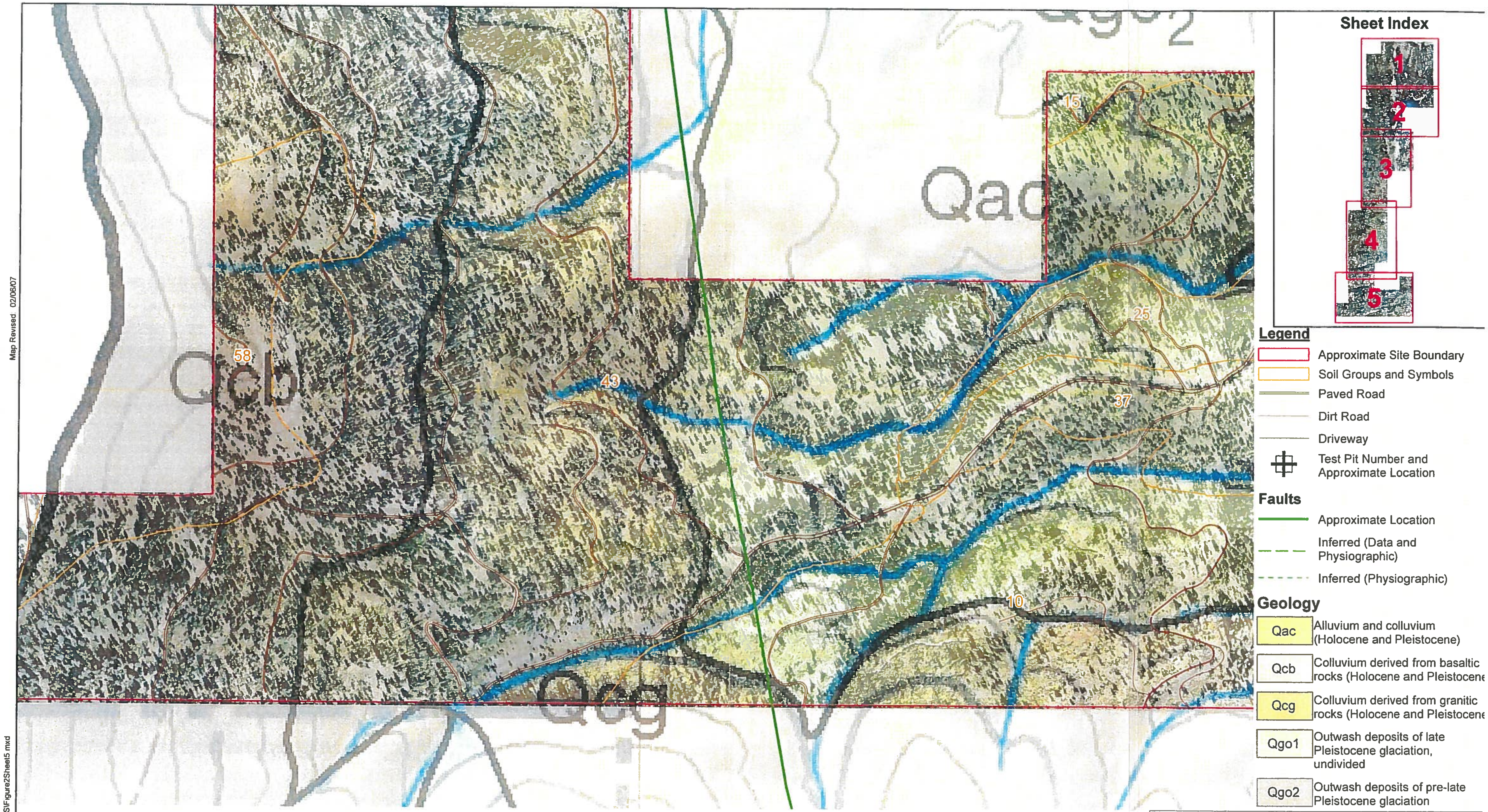
Boise



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Red Ridge 3000-Acre Development
Valley County, Idaho

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Figure 2
Sheet 5 of 5

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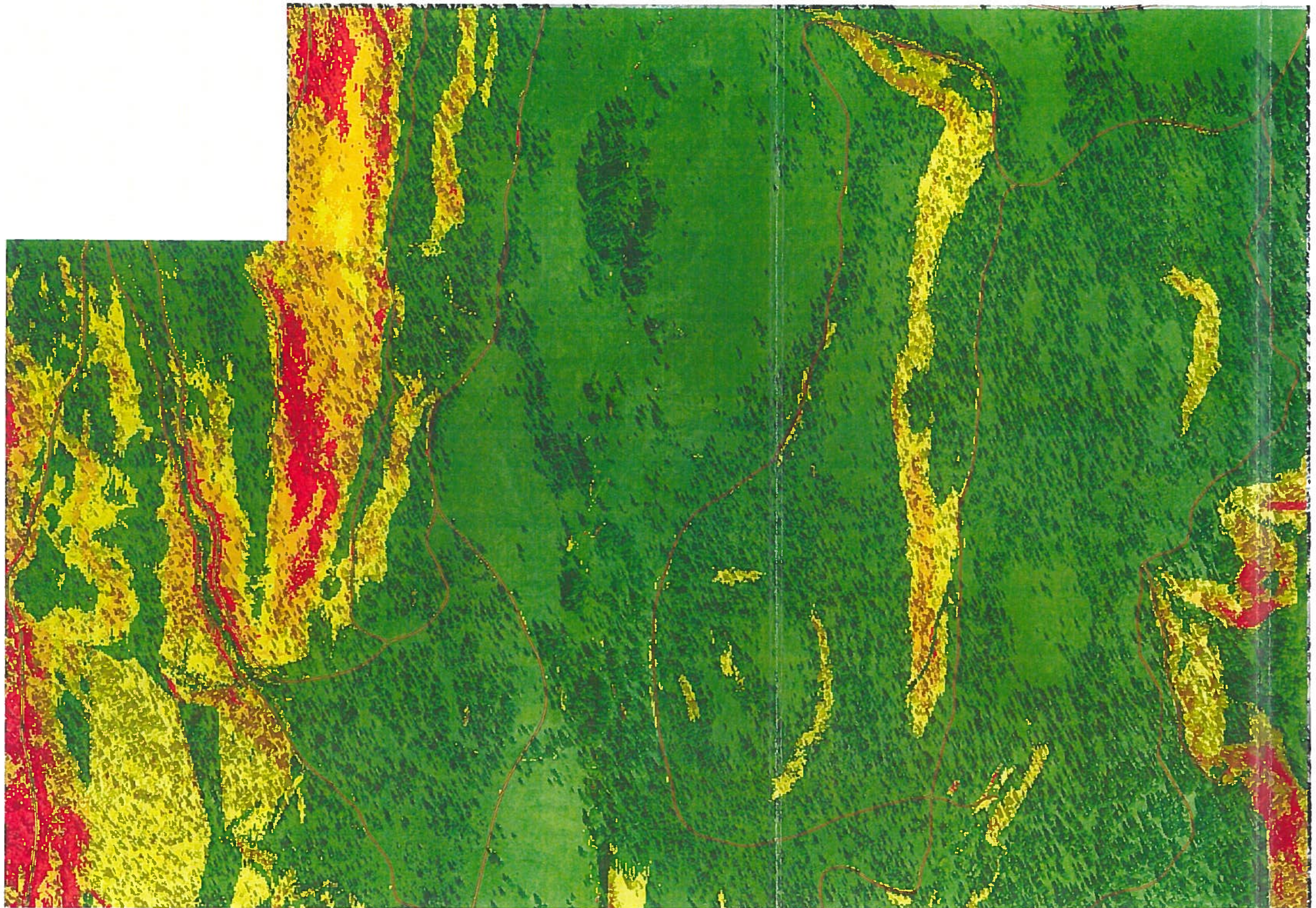
Boise Path: 15835008\00\GIS\Figure3Sheet1.mxd Map Revised: 02/06/07



Sheet Index

Legend

Slopes

- Less than 4:1
- 4:1 to 3:1
- 3:1 to 2:1
- Greater than 2:1
- Paved Road
- Dirt Road
- Driveway

700 0 700

Feet

N W E S

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Slope Overlay

Red Ridge 3000-Acre Development
Valley County, Idaho

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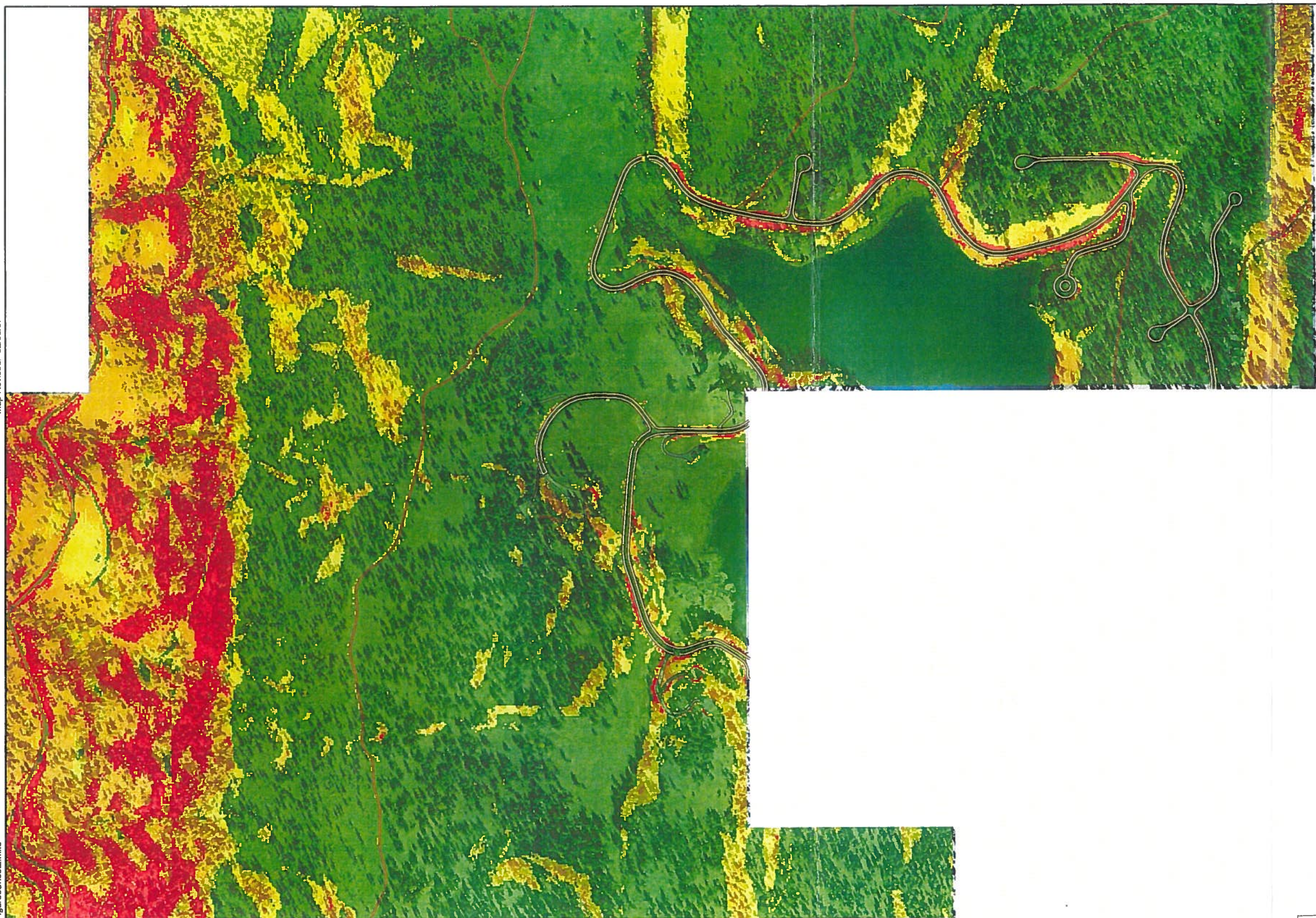
Figure 3
Sheet 1 of 5



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Slope Overlay

Red Ridge 3000-Acre Development
Valley County, Idaho

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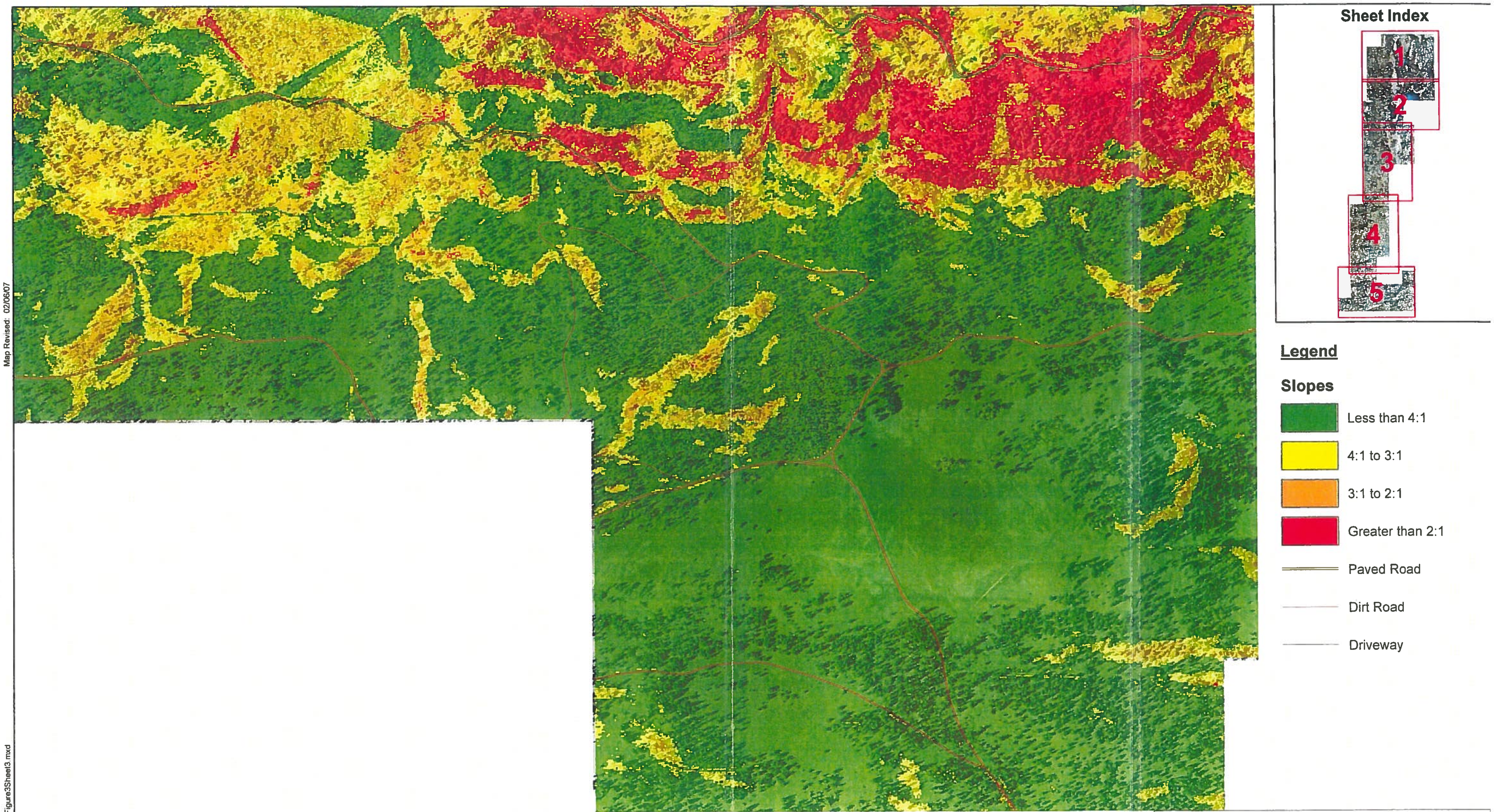
Figure 3
Sheet 2 of 5



Map Revised: 02/06/07

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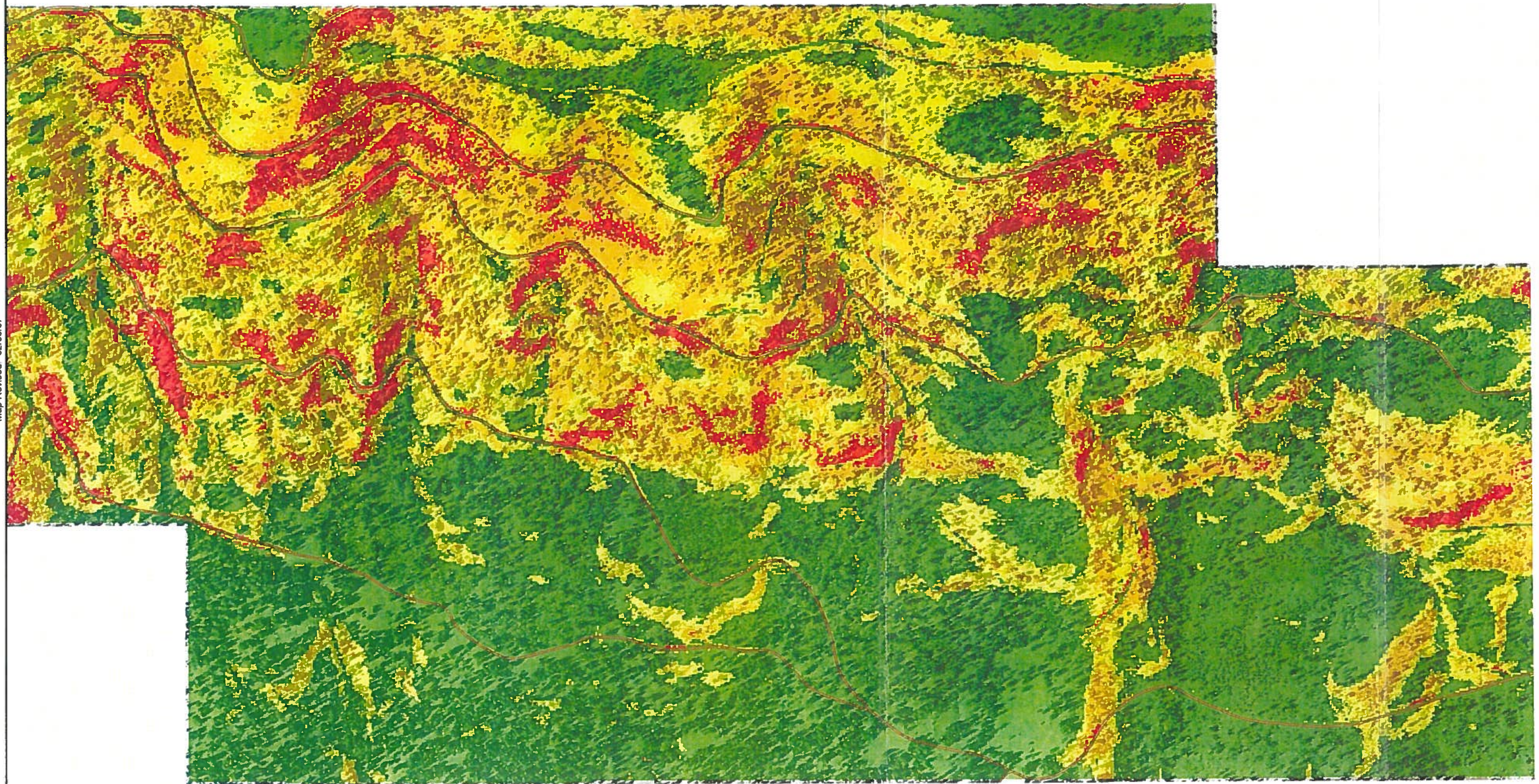
Red Ridge 3000-Acre Development
Valley County, Idaho

GeoEngineers

Figure 3
Sheet 3 of 5



Sheet Index

Legend

Slopes

- Less than 4:1
- 4:1 to 3:1
- 3:1 to 2:1
- Greater than 2:1
- Paved Road
- Dirt Road
- Driveway

700 0 700
Feet

W N S E

Reference: 2004 aerial photos and topography obtained from Secesh Engineering on 11/25/06.

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for infomation purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Slope Overlay

Red Ridge 3000-Acre Development
Valley County, Idaho

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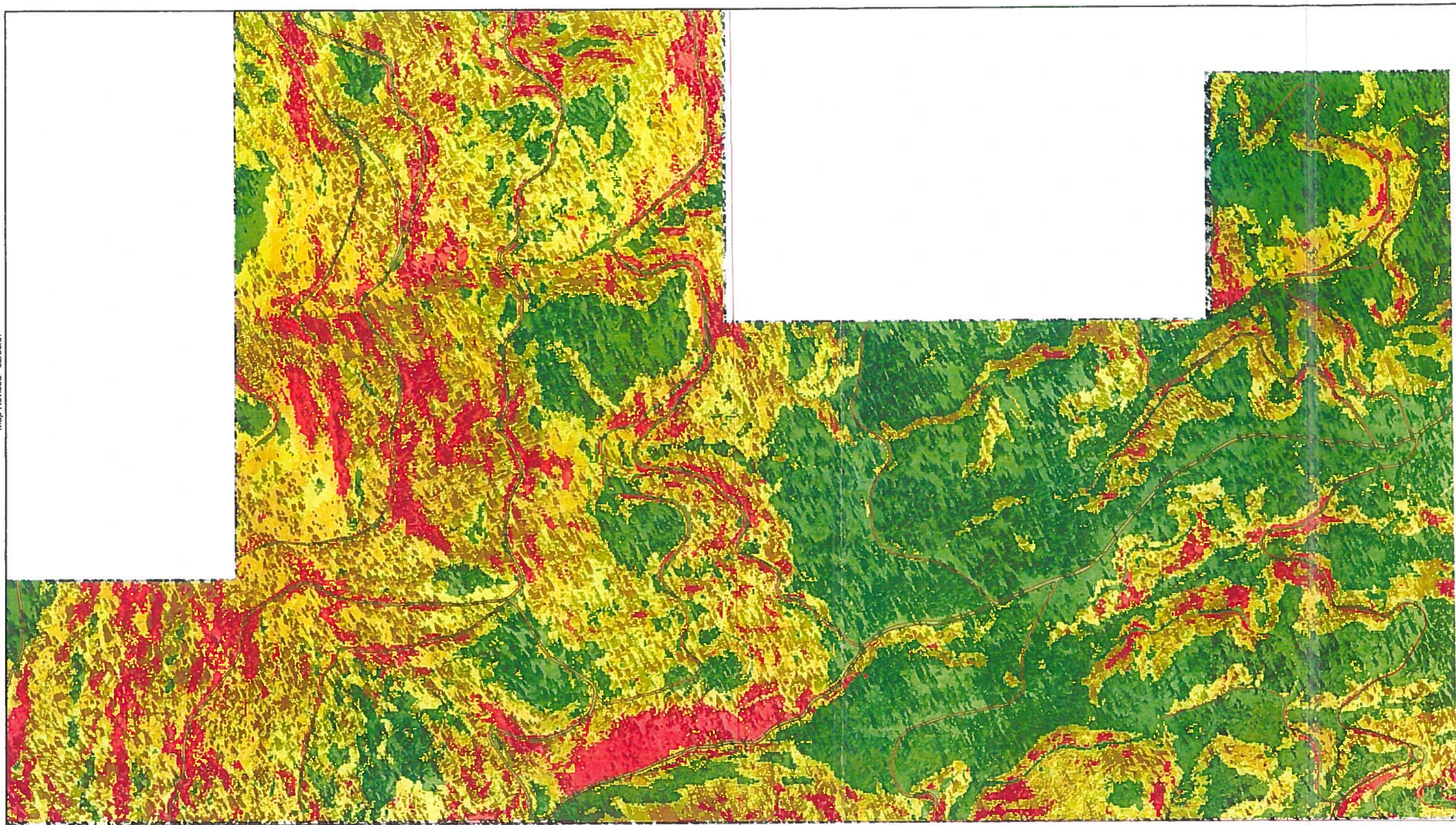
Figure 3
Sheet 4 of 5



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