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PRELIMINARY SOILS, GEOLOGY, GEOLOGIC HAZARD AND LAND USE STUDY 462 ACRE BAPTIST CHURCH PARCEL 780 EAST BAPTIST ROAD EL PASO COUNTY, COLORADO

Prepared for

Classic Communities
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Attn: Jerry Novak

June 3, 2005

Respectfully Submitted,

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Entech Job No. 51175
2MSW/rep/2005/51175ghs

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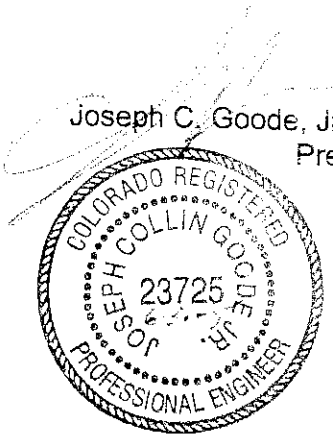

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1.0 SUMMARY

Project Location:

The project lies in a portion of Sections 29 and 30, Township 11 South, Range 66 West of the 6th Principal Meridian. The site is located north of Baptist Road, in El Paso County, Colorado.

Project Description:

Total acreage involved in the project is approximately 461 acres. No development plan was available at the time of this investigation

Scope of Report:

The report presents the results of our geologic investigation and treatment of engineering geologic hazard study. This report presents the results of our preliminary geologic reconnaissance, a review of available maps, aerial photographs and our conclusions with respect to the impacts of the geologic conditions on development.

Land Use and Engineering Geology:

Geologic conditions will impose some constraints on development and land use. These include areas of potentially expansive soils, artificial fill, unstable slopes, potentially unstable slopes, downslope creep, rock fall hazards, ponded water, seasonal and potentially shallow groundwater. Areas of shallow bedrock may also be encountered. Site conditions will be discussed in greater detail in this report. All recommendations are subject to the limitations discussed in the report.

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site lies in a portion of Sections 29 and 30 Township 11 South, Range 66 West El Paso County, Colorado. The site is located north of Baptist Road approximately 3 miles southeast of Monument, Colorado. The location of the site is shown on the Vicinity Map, Figure 1.

The topography of the site ranges from gently to steeply sloping. Minor drainages exist on the site and flow in southerly and westerly directions. No water was observed flowing in these drainages at the time of this investigation, however, an area of ponded water was observed. The area of the site is indicated on the USGS Map, Figure 2. The site is currently being used as a Church Camp and Conference Area. Several structures, cabins, and trailers exist on the site. The site contains primarily ponderosa pine tree coverage with an understory of low field grasses, weeds and shrubs. Site photographs are included in the Appendix . The approximate location and direction of the photographs are indicated on the Geology Map, Figure 10.

The properties to the west and south of the site are single-family residential development. The properties to the north of the site are developed as single family estates. Fox Run Regional Park exists east of the site Total acreage involved in the proposed development is approximately 461 acres. No development plan or detailed topographic map was available at the time of this investigation. It is our understanding single-family residential development is proposed. The majority of the development will be central water and sewer. Some lots on the northern portion may utilize individual wells and septic systems.

3.0 SCOPE OF THE REPORT

The scope of this report will include the following:

- A preliminary geologic analysis of the site utilizing published geologic and soils data.
- Preliminary site-specific mapping of major geographic and geologic features.
- Identification of geologic hazards and impacts on the proposed development.

- Recommended mitigation of geologic hazards where they affect development.

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a preliminary geologic map of bedrock features and significant surficial deposits. The Soil Conservation Service (SCS) survey was also reviewed to evaluate the site.

The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved field reconnaissance, measurements and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identifies pertinent geologic conditions affecting development.

This investigation is intended to be preliminary for land use decisions. A subsurface soil investigation was not performed as a part of this study. A subsurface soil investigation and detailed mapping will be necessary prior to final recommendations.

Other reports done in the vicinity of the site by Entech Engineering, Inc. have included a Soils and Geology Study performed on a property south of the site dated August 21, 1996 (Reference 1), a Soil, Geology and Wastewater Study performed on a property northeast of the site, dated January 3, 2002 (Reference 2), and several subsurface soil investigations for lots in the Homestead at Jackson Creek Subdivision, Filing No. 3, west of the site (References 3 and 4). Additionally, a study was performed by Charles S. Robinson and Associates for El Paso County Planning Department in 1977 (Reference 5) including geologic mapping and engineering characteristics of the site. These reports and studies were used in evaluating the area conditions.

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 5 miles to the west is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northerly direction. The rocks in the area of the site are sedimentary in nature, and typically Tertiary to Cretaceous in age. The bedrock underlying the site itself is the Dawson Formation. Overlying the Dawson are unconsolidated deposits of residual, alluvial and artificial soils. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Service

The Soil Conservation Service (Reference 6) has mapped three soil types on the site (Figure 3). In general, the soils consist of gray gravelly, sandy loam and brown sandy loam over a pale brown gravelly, loamy sand subsoil with some lenses of sandy clay loam. Soils are described as follows:

Type	Description
41	Kettle gravelly loamy sand, 8-40% slopes
42	Kettle – Rock outcrop complex
93	Tomah – Crowfoot loamy sands, 8-15% slopes

Complete descriptions of the soils are presented in Figures 4 through 6. The soils have generally been described to have moderate to rapid permeabilities. Special design for roadways may be necessary due to frost heave. Limitations for development as described by the Soil Conservation Service include frost action potential, moderate to steep slopes, depth to bedrock, fire hazard during dry periods and erosion potential due to surface runoff. Possible hazards with soil erosion are present on the site. Gullies may form in drainageways. The erosion potential can be controlled with vegetation and other methods described in the Erosion Control Section of this report. The majority of the soils have been described to have slight to high erosion hazards.

5.3 Site Stratigraphy

The Front Range Geologic Map showing the general area of the site is presented in Figure 7 (Reference 7). The Monument Quadrangle Geology Maps showing the site as prepared by The Robinson Study (Reference 5) and the Colorado Geological Survey (Reference 8) are presented in Figures 8 and 9, respectively. The Geology Map prepared for the site is presented in Figure 10. The geologic mapping is preliminary and has been mapped on a USGS topographic map. Detailed geologic mapping for the site will be provided when a detailed topographic map base is made available. Four mappable units were identified within the mapped area, which are identified as follows:

- **Qaf** **Artificial Fill of Quaternary Age:** These are man-made fill deposits and fill piles observed on-site. Unless records can be obtained, the fill will be considered uncontrolled for construction purposes.

- **Qal** **Recent Alluvium of Quaternary Age:** These are recent stream deposits associated with the drainages on-site. They typically consist of silty to clayey sands and may be highly stratified, containing lenses of very silty or clayey soil.

- **QTa** **Alluvium of the Palmer Divide of Quaternary to Tertiary Age**: These are water deposited materials that occur as pinkish brown coarse grained silty sands. Gravel and cobbles derived from the Pikes Peak Granite and the Dawson formation may also be present.

- **Tkd** **Dawson Formation of Tertiary to Cretaceous Age:** This formation consists of coarse grained arkosic sandstone with interbedded lenses of fine grained sandstone, claystone or siltstone. Typically, it is buff to light brown and light gray in color. A variable layer of residual soils may be present overlying the Dawson formation. These are formed by the in-situ weathering of the bedrock materials on-site.

The soils listed above were mapped from the Site-specific preliminary field mapping, *The Geologic Map of the Colorado Springs-Castle Rock Area Front Range Urban Corridor, Colorado,* by Trimble and Machette, 1979 (Reference 7, Figure 7), and the Robinson Study in

1977 (Reference 5, Figure 8) and *The Geologic Map of the Monument Quadrange,* by Thorson and Madole in 2003 (Reference 8, Figure 9). A summary of the geologic units mapped on this site as described in the Robinson Study (Reference 8) is included on Table 1.

5.4 Soil Conditions

The Soil Conservation Service (SCS) was reviewed for soil characteristics (Reference 6) A table of the SCS Soil Properties and Classifications for the soils on this site is presented in Table 2. The majority of the site is mapped as Soil Type 41: Kettle gravelly loamy sand. (Figure 3) These soils generally classify as silty to clayey sands (SM, SC, SM-SC) with low shrink/swell potential. Soil Type 42: Kettlerock Outcrop Complex is mapped in the southwest corner of the site. These soils are similar to Soil Type 41 and also generally classify as silty to clayey sands (SM,SC,SM-SC) with low shrink/swell potential. Soil Type 93: Tomah Crowfoot loamy sands is mapped in the extreme southwest corner of the site. These soils generally classify as silty sands with a layer at 22 to 48 inches that classifies as a clayey sand to sandy clay (SC,CL). These soils generally have a low shrink/swell potential with a moderate shrink/swell potential in the clayey lense at 22 to 48 inches. A site-specific subsurface soil investigation will be necessary prior to development to determine specific soil properties and swell potentials.

5.5 Groundwater

Areas of ponded water, seasonal and potentially seasonal shallow groundwater have been mapped in this site. These areas are discussed in the following section. Test borings drilled on-site will further delineate groundwater depths on-site. A Subsurface Soil Investigation will be necessary to determine groundwater levels

Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Isolated sand layers within the variable soil profile, sometimes only a few feet in thickness and width, can carry water in the subsurface. Water may also flow on top of the sandstone.

6.0 ENGINEERING GEOLOGY - IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, preliminary mapping has been performed on this site to produce an Engineering Geology Map (Figure 10). This map shows the location of various geologic conditions of which the developers and planners should be cognizant during the planning, design and construction stages of the project. Detailed mapping should be performed when a more detailed topographic map base is made available. The hazards identified on this site include areas of artificial fill, potentially expansive soils, unstable slopes, potentially unstable slopes, downslope creep, rock fall, ponded water, potentially seasonal shallow groundwater and seasonal shallow groundwater. The following hazards have been addressed as a part of this investigation.

Expansive Soils

The site is classified in an area of low to moderate swell potential according to *the Map of Potentially Swelling Soil and Rock in the Front Range Urban Corridor, Colorado* by Hart, 1974 (Reference 10). While many of the soils in the area of the site typically have low swell potential according to the Soil Conservation Service (Reference 6, Table 2), the potential for expansive clays encountered in the subsurface is possible on this site. These occurrences are typically sporadic, therefore, none have been indicated on the maps. These clays, if encountered beneath foundations, can cause differential movement in the structure foundation. These occurrences should be identified and dealt with on an individual basis.

Mitigation: Should expansive soils be encountered beneath the foundation, mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at a minimum of 90% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation which is common in the area. Another alternative in areas of highly expansive soils is the use of drilled pier foundation systems. Typical minimum pier depths are on the order of 20 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

Subsidence Area

Based on a review of Subsidence and Coal Mining reports for the Colorado Springs area and State Mineral Lands for El Paso County (References 11-13), the site is not undermined. The closest underground mines in the area are 9 miles to the south therefore, it is anticipated there is a low potential for subsidence on this site.

Landslide Hazard

The site is not mapped within any past landslide deposits (References 5, 7, and 8). No recent landslide features were observed on the site, however, areas of unstable and potentially unstable slopes exist that could trigger isolated slides if not handled properly. Additionally, areas of downslope creep have been identified on the site. These slopes and suggested mitigation techniques will be discussed under Slope Stability.

Slope Stability

Many of the slopes on the site have been identified as downslope creep, potentially unstable and unstable slopes on the Engineering Geology Map (Figure 10). Recommendations for these areas are discussed as follows:

Downslope Creep Areas

These areas are acceptable as building sites, however, in areas identified with this hazard classification, we would anticipate accelerated lateral and vertical movement of the near surface soils in the downslope direction.

Mitigation: One option for mitigation in downslope creep areas is avoidance, however, these areas are buildable with the following constraints. This type of movement will increase pressures against foundation walls on the uphill side of structures. The design of foundations in these areas should account for this additional pressure. The lateral pressure distribution for sloping conditions in downslope creep area is presented in Figure 11. Tie-beams and special foundation design may be necessary in some areas. Where possible, in areas of downslope creep, structures should be designed to be as compact and rigid as possible. This will help them better tolerate the vertical and lateral movements to which the foundation system may be subjected with minimal damage. Long, rambling, irregular structures should be avoided, as they are associated with much greater potential for damaging differential movement. Additionally, structures should be designed to step up the slope. Deep cuts in these areas should be avoided. Any retaining walls proposed in these

areas should also be properly designed for by a qualified professional engineer the global slope stability.

Potentially Unstable Slopes

Some of the very steep slopes have been identified as potentially unstable. These slopes are considered stable in their present condition, however, considerable care must be exercised in these areas not to create a condition which would tend to activate instability.

Mitigation: Additional investigation is recommended if development is to be considered in this area. Site specific mapping and measurements will be necessary once a more detailed topgraphic map base is made available. Slope stability analysis may be required. Deep cuts on the slope or in the toe area of the slopes should be avoided. Proper control of drainage at both the surface and in the subsurface is extremely important. Areas of ponded water at the surface should be avoided. Utility trenches, basement excavations and other subsurface features should not be permitted to become water traps which may promote saturation of the subsurface materials. Interceptor drains should be used in areas above potentially unstable slopes. Specific recommendations should be made after additional investigation when development and grading plans are finalized.

Unstable Slopes

Some of the steeper slopes on-site have been identified as unstable slopes. These are areas where exposed rocks and cliffs exist. Boulder and cobble-sized talus can be produced due to erosion and steep slopes in these areas. The rockfall hazard is discussed in the following section.

Mitigation: Building should be avoided on these slopes. Structures should be located a minimum of 30 feet from the crest or a toe of these slopes unless additional slope stability analysis is performed. Additionally, the recommendations for the potentially unstable slopes concerning drainage applies to these slopes as well.

Rockfall Hazard

Areas were encountered on site where sandstone outcrops are exposed and produce boulder and cobble-sized talus. The areas of this rockfall hazard are divided into two separate zones based on the severity of the hazard. Areas lying topographically below the runout zone would be considered reasonably safe from rockfall. Preliminary mapping of rockfall zones are shown on the Engineering Geology Map, Figure 10. Detailed mapping of these areas should be performed when a more detailed topographic map base is made available. Recommendations for the rockfall areas are presented as follows:

rfs – rockfall source area: This zone delineates the major rockfall source areas or the sandstone bluffs and outcrops themselves. This area carries the highest risk of damaging rockfall, but also is an area which is not likely to be considered for development for many reasons. Some of the rock fragments located within this zone should be stabilized or knocked down to more stable areas, lessening the hazard in areas below this zone.

Mitigation: Stabilization of the area can include removal of loose blocks of rock, often referred to as scaling. Other techniques include stabilization of loose blocks mechanically and may involve pinning the loose rocks to the face of the cliff to prevent dislodgment. This may be accomplished with Portland cement grout, gunite or a combination of mechanical rock bolts and some form of netting material such as chainlink fence or other similar materials. Some of these techniques, although effective in controlling rockfall, can be very unpleasing aesthetically.

rfr – rockfall runout zone: This area delineates the runout zone immediately beneath the rockfall source areas. This area is typically strewn with many large rock fragments in a state of marginal instability. The detached rock fragments already present in this zone may also serve as a source of rockfall to the slopes below. Permanent structures in this zone could be anticipated to be subject to impact from boulders and talus having a low to moderately high velocity depending upon their position in the zone and the steepness of the slope. Many of the rock source areas are minimal and mitigation such as scaling and grouting could be economically feasible. Many of the smaller outcrops can be easily stabilized.

Mitigation: Should construction in the runout zone or immediately adjacent to this zone be considered, the following mitigations should be followed: Depending upon the location of the structure in the zone, several mitigation techniques are used. One method in slow

velocity zones is the use of concrete foundation walls on the upslope side that extended a minimum of 4 feet above grade, with no windows located in this portion of the concrete wall, to help prevent catastrophic damage to a structure in the event of rockfall impact. In addition, the use of earthen berms sloping away from structure foundations for a distance of at least 15 feet may also be used to significantly reduce the danger of damage from rockfall impact. Grades of 10 percent are recommended. An alternative to the earthern berms, particularly in areas of moderate velocity includes cable fencing and concrete or rock building walls designed by a qualified professional geologist to catch debris that may be dislodged. Loose blocks will require stabilization as discussed under the rockfall source area that includes grouting. It is anticipated that the rockfall mitigation will incorporate several of the above systems.

Debris Fans

Based on site observations, debris fans were not observed in this area.

Floodplain and Drainage Areas

Areas within the drainages on site have been identified as areas of ponded water, seasonally shallow groundwater areas and potentially seasonally shallow groundwater areas. The majority of these areas are associated with drainages on-site. Water was not flowing in drainages at the time of this investigation although one area on site contained ponded water. No areas of the site lie within any floodplain zones according to the FEMA Map Nos. 08041CO279F, 08041CO285F, 08041CO287F and 08041CO295F, Figure 12 (Reference 14).

Areas of Ponded Water

These are areas of standing water behind an earth dam on site. We would not expect development in this area. Either the dam can be avoided by construction or the area may be completely regraded. Should complete regrading of the site be considered, all organic matter and soft, wet soils should be completely removed before filling. Any drainage into these areas should be rerouted in a non-erosive manner off of the site where it does not create areas of ponded water around proposed structures.

Potentially Seasonal High Groundwater

In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and possible frost heave potential, depending on the soil conditions.

Mitigation: In these locations, foundations in areas subject to severe frost heave potential should penetrate sufficient depth so as to discourage the formation of ice lenses beneath foundations. At this location and elevation, a foundation depth for frost protection of 2.5 feet is recommended. In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to help prevent the intrusion of water into areas located below grade. Typical perimeter drain details are presented in Figure 13. Additionally, swales should be created to intercept surface runoff and carry it safely around and away from structures. Additional investigation is recommended in these areas prior to building. Site grading may mitigate the drainages in some areas. The water table may be of sufficient depth to minimize the effects on buildings in some areas.

Seasonally High Water Table

In these areas, high subsurface moisture condition, frost heave potential and highly organic soils may exist.

Mitigation: These areas lie within drainages and in many areas can be avoided by development. In areas where development is desired, overlot grading may mitigate the drainages. Swales should be created in other areas to intercept surface water and carry it safely away from structures. All organic material should be removed prior to any filling. The same mitigation recommendations for potentially high groundwater areas as discussed previously should be followed in these areas of seasonally high groundwater. Additional investigation will be necessary to determine the water depth and its affect on development. Other areas than those mapped could encounter groundwater that could affect shallow foundations on site.

Artificial Fill

Fill associated with berms and piles was observed on site. Additionally, other areas of artificial fill may be encountered on site that were not mapped. These berms and piles are considered uncontrolled for construction purposes.

Mitigation: These areas are limited and it is anticipated they will be removed during site grading. Any uncontrolled fill encountered beneath foundation will require removal and recompaction at a minimum of 90% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Faults

The closest fault is the Rampart Range Fault, located 5 miles to the west. No faults are mapped on the site itself. Previously Colorado was mapped entirely within Seismic Zone 1, a very low seismic risk. Additionally, the Uniform Building Code (UBC), 1997, currently places this area in Seismic Risk Zone 1. According to a report by the Colorado Geological Survey by Robert M. Kirkman and William P. Rogers, Bulletin 43 (1981) (Reference 15) this area should be designed for Zone 2 due to more recent data on the potential for movement in this area, and any resultant earthquakes.

Dipping Bedrock

The bedrock underlying the site is the Dawson Formation of Tertiary to Cretaceous Age. The Dawson in this area is very gently dipping a northerly direction according to the *Geologic Structure Map of the Pueblo 1x2 Quadrangle, South-Central Colorado* (1978) (Reference 16). Bedrock observed on this site was gently dipping in a northerly direction. It is not anticipated steeply dipping expansive bedrock will be encountered on tis site. Mitigation is necessary where expansive bedrock dipping over 30 degrees is encountered beneath foundations. Specific recommendations should be made after additional investigation.

Radioactivity

Gamma Radiation

Levels of gamma radiation taken on the site ranged from 13 to 18 inches micro R/Hr. Levels ranging from 14 to 18 micros R/Hr were taken on areas surrounding the site. These readings are below typical mitigation levels. Typically mitigation involves over excavation and replacement of the soils. Additional measurements in excavated areas are recommended to determine the need for mitigation.

Radon

Radon levels for the area have been reported by the Colorado Geologic Survey in the Open-File, Report No. 91-4 (Reference 17). Radon levels ranging from 0 to 20 pci/l have been measured in the area. The following is a table of radon levels in this area.

0<4 pci/l	100.00
4<10 pci/l	0.00
10<20 pci/l	0.00
>20 pci/l	0.00

Only one reading has been taken in the area and it is below 4 pci/l. This level is not considered excessive, however, the minimal information from this report is not sufficient to determine if radon levels are higher for this site. According to the El Paso County Natural Hazard Maps for Radon (Reference 18), the area of the site is mapped with levels greater than 4 pci/l. An occurrence of radioactive minerals has been identified 4.5 miles south of the site (Reference 19). This occurrence is associated with a limonite deposit in the Dawson Formation. No known occurrences exist on the site, however, radon gas originating in the bedrock underlying the site could migrate up into the upper soil profile.

Mitigation: The potential exists for radon gas to build up in areas of the site. Build-ups of radon gas can be mitigated by providing increased ventilation of basements and site specific testing after the site is constructed.

7.0 ON-SITE DISPOSAL OF WASTEWATER

A development plan was not available at the time of this investigation. It is our understanding that in the northern portion of the site may utilize individual sewage treatment systems. The site will require evaluation according to the El Paso County Land Development Code prior to final approval.

The Soil Conservation Service (SCS) soil map and soil descriptions are presented in Figures 3 through 6. The site has been mapped with 3 soil descriptions. The soils are described as having moderate to rapid percolation rates. The majority of the soils in the northern portion of

the site are mapped as Soil Type 41: Kettle gravelly loamy sand. According to the SCS, permeabilities on these soils range from 6.0 to 20 inches/hour. The permeabilities on these soils are considered rapid. Limitations to setic systems on these soils as described by SCS include severe slope. El Paso County guidelines require designed systems for slopes steeper than 30%.

Shallow bedrock may be encountered on the northern portions of this site. Designed systems are generally required in areas of shallow bedrock.

Leach fields must be maintained a minimum of 4 feet above groundwater. Areas of seasonal and potentially seasonal shallow groundwater areas have been mapped on the site. Should groundwater be encountered within 6 feet of the surface, shallow leaching fields would be recommended. In areas where groundwater is less than 4 feet, designed systems will be required.

The soils described in the Soil Conservation Service in this area generally have rapid percolation rates that are suitable for conventional systems. El Paso County guidelines require designed systems for percolation rates exceeding 60 minutes per inch. Where shallow bedrock, shallow groundwater, or steep slopes are encountered, designed systems may be required. In areas where suitable percolation rates cannot be found, designed systems will be required in these areas as well. Percolation testing should be performed on the site after development plans are finalied. Specific percolation testing will be required on each individual lot prior to construction.

8.0 EROSION CONTROL

The soil types observed on the site are mildly to moderately susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed, and vegetation reestablished, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap.

In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to re-vegetate successfully. Therefore, recommendations pertaining to the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

9.0 ECONOMIC MINERAL RESOURCES

Some of the sandy materials on-site could be considered a low grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 20), the area is not mapped with any resources. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 21), areas of the site are not mapped with any resources. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 13), the area of the site has been

mapped as "Good" for industrial minerals. Several mines exist in the area of the site for sand and gravel. Two inactive gravel quarries are located immediately south of the site. Considering the silty to clayey nature of much of these materials and abundance of similar materials through the region and the close proximity to developed land, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 13), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as "Poor" for coal resources. No active or inactive mines have been mapped in the area of the site. No metallic mineral resources have been mapped on the site (Reference 13).

The site has been mapped as "Fair" for oil and gas resources (Reference 13). No oil or gas fields have been discovered in the area of the site. The sedimentary rocks in the area lacked the essential elements for oil or gas.

10.0 RELEVANCE OF GEOLOGIC AND SITE CONDITIONS TO LAND USE PLANNING

It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on development and construction. Unstable slopes and rockfall source areas should be avoided by construction. Other constraints identified on the site such as the potential for expansive soils, seasonal shallow groundwater areas, downslope creep and artificial fill can be mitigated through proper engineering design and construction. Geologic conditions and land use considerations from the Robinson Study (Reference 9) are presented in Table 1.

The majority of the soils expected at typical foundation depths consist of silty to clayey sands. These soils will provide good support for residential foundations. Areas of shallow bedrock may be encountered on this site. Difficult excavation should be expected in areas of shallow bedrock. Shallow bedrock will also affect the type or location of individual septic systems, should they be used. Expansive layers may be encountered across the site. Expansive soils, if encountered, will require special foundation design and/or overexcavation and replacement with

non-expansive material compacted at a minimum of 90% of its maximum Modified Proctor Dry Density ASTM D-1557. These soils will not prohibit development.

Areas of seasonal and potentially seasonal shallow groundwater may be encountered on the site. In these areas, drains may be necessary in order to prevent the seepage of water below grade. Additionally, shallow groundwater may affect the type and location of individual septic systems should they be used. Additional investigation is recommended to delineate groundwater levels across the site.

An area of ponded water observed on-site can be avoided by development. Should grading be desired in this area, all soft, wet or organic soils should be removed prior to filling.

Areas of unstable slopes should be avoided by development. A building setback of 30 feet is recommended from the crest or toe of the unstable slopes. Set backs from slope may be modified if slope specific analysis is completed.

Areas of potentially unstable slope and downslope creep areas have been identified on this site. Detailed mapping of the areas should be performed when a detail topographic map base is made available. Additional investigation is recommended in areas of potentially unstable slopes should development be considered in these areas. Slope Stability Analysis may be required. In areas of downslope creep, structures should be designed to be as compact and rigid as possible. Foundations may require tie-beams or additional foundation reinforcement in these areas. Foundations should be designed to step up the slopes to avoid deep cuts. Deep cuts should be avoided on all steeper sloping areas of the site. Any retaining walls proposed should be designed for the global slope stability by a qualified professional engineer. Proper control of drainage at both the surface and subsurface is important. Saturation of materials should be avoided that may create unstable conditions.

Areas of rockfall hazards exist on this site. Should development be considered in these areas, mitigation will be necessary. Exact locations of these hazards should be identified when a detail topographic map is made available. Mitigation in these areas may involve stabilization of loose rocks by scaling grouting or bolting. The use of designed walls or cavement structures is another alternative. Specific mitigation recommendations should be made on an individual basis after additional investigation.

Fill piles were observed on site. It is anticipated these will be removed during site grading. Any uncontrolled fill encountered beneath foundations should be removed and recompacted at a minimum of 90% of its maximum Modified Proctor Dry Density, ASTM D-1557.

In summary, development of the site can be achieved if the items mentioned above are either avoided or mitigated. Much of this site is not affected by major geologic constraints. The majority of the western portion of the site will be affected by downslope creep. Special foundation designs may be required in these areas. This report is intended for preliminary planning and development decisions. Additional investigation is recommended involving more detailed mapping and a Subsurface Soil Investigation prior to final recommendations.

11.0 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose constraints on development and construction of the site. These conditions should be considered as development and grading plans are finalized.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems. Individual investigations for building sites will be required prior to construction. Planning and design personnel should be made familiar with the contents of this report.

This report has been prepared for Classic Communities for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust this report has provided you with all the information you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

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TABLES

Table 1: Summary of Geologic Units/ Land Use Considerations

Map Symbol	Map Unit, description	Workability	Surface drainage, erodibility, groundwater	Suitability for waste disposal	Foundation stability	Potential Geologic hazards	Geologic resources
Qaf	artificial fill: includes large road fills.	Generally poor	Infiltration: low. Runoff: high. Low to moderate erodibility in compacted fill.			Highly erodable, uncompacted, slopes could be stabilized by seeding and planting.	
Qal	Alluvium: silt, sand, gravel and boulders in the bed of streams, on valley floors and in the lowest terraces along streams.	Excavation and compaction easy except where bouldery.	Infiltration: medium to high. Runoff: moderate subject to stream scour and stream bank erosion. Water table may be permanently or seasonally within a few feet of the surface.	Septic Systems: unsatisfactory generally within or adjacent to waterway and in areas of seasonal high groundwater. Dump Sites: unsatisfactory because of high groundwater or seasonal flooding.	Poor: loose and erodible materials.	Deposits are subject to annual or periodic flooding. Low terrace banks may be undercut by stream erosion.	Source of sand and gravel.
Qc Tkd	Colluvium Dawson Formation (upper part). Coarse grained and pebbly arkosic sand clay and silt derived from arkosic sandstone, claystone, and shale. Claystone and shale may be expansive.	Excavation and compaction moderately difficult to difficult in cliff forming units.	Infiltration: medium to high. Runoff: low to high in clays and shales. Highly erodible by gullying and slope wash. Yield to wells ranges from 4 to 500 gallons per minute.	Septic systems: excellent to poor depending upon percolation. Dump sites: unsuitable because of potential of polluting major groundwater aquifers.	Fair to excellent. Clay and claystone may be expansive.	Expansive clay. Talus deposits form at base of cliffs and steep slopes may be unstable.	Locally may contain seams of lignite.

from Charles S. Robinson and Associates, Inc. 1977. *Table of Engineering and Engineering Factors for Land Use, El Paso County, Colorado.*

Table 2: SCS Soil Properties and Classifications

Soil Type 41: Kettle gravelly loamy sand

Depth (inches)	Percent Passing Sieve No.				Atterbert Limits		Unified Soil Classification System	Shrink Swell Potential
	4	10	40	200	LL	PI		
0-3	80-95	50-100	25-70	10-25	NV	NP	SM	Low
3-40	85-100	50-100	25-70	15-35	25-35	5-15	SC,SM-SC	Low
40-60	75-90	20-50	10-25	0-15	20-30	5-10	SM-SC, SP-SC	Low

Soil Type 42: Kettle-Rock outcrop complex

Depth (inches)	Percent Passing Sieve No.				Atterbert Limits		Unified Soil Classification System	Shrink Swell Potential
	4	10	40	200	LL	PI		
0-3	80-95	50-100	25-70	10-25	NV	NP	SM	Low
3-40	85-100	50-100	25-70	15-35	25-35	5-15	SC,SM-SC	Low
40-60	75-90	20-50	10-25	0-15	20-30	5-10	SM-SC, SP-SC	Low

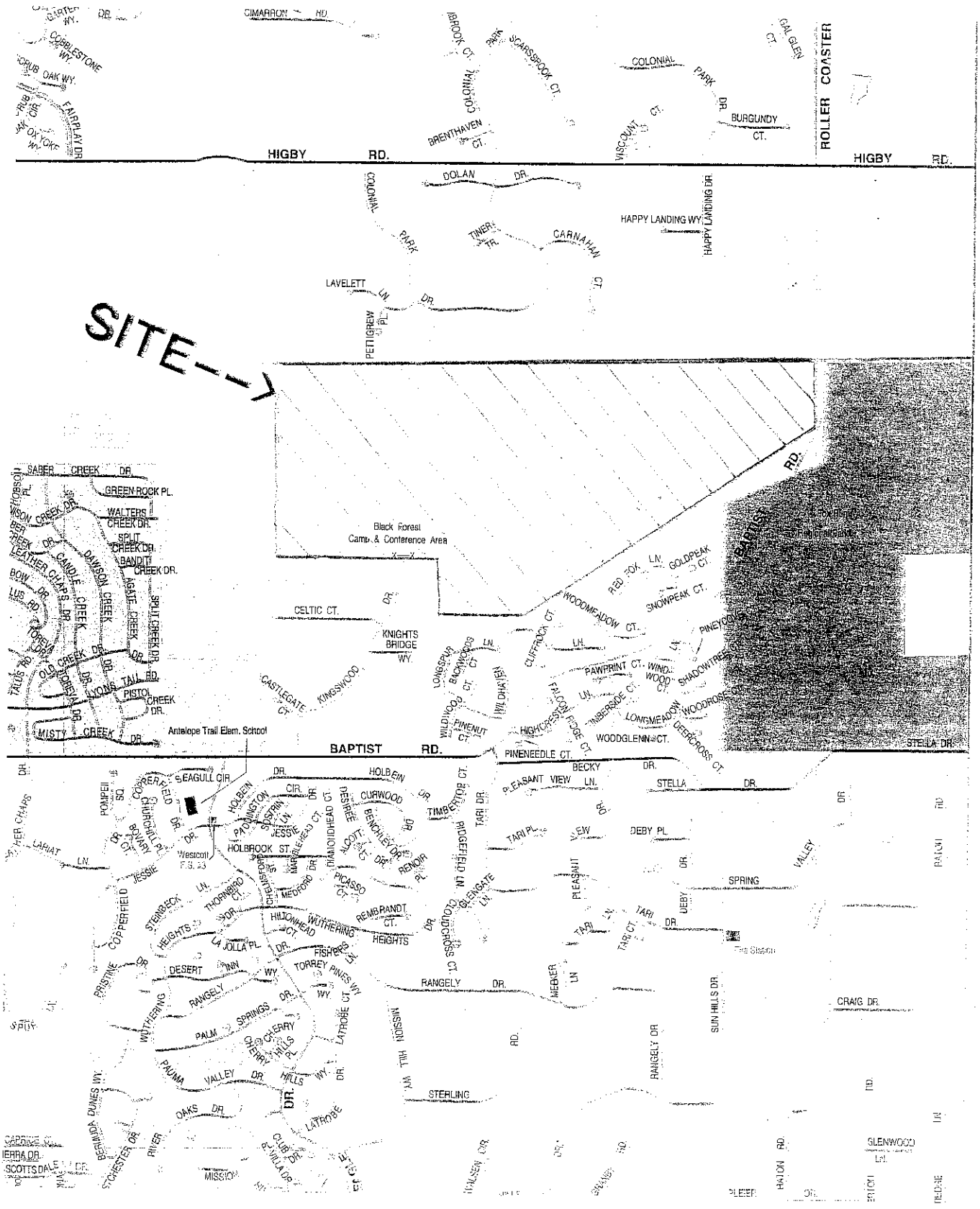
Soil Type 93: Tomah Crowfoot loamy sands Tomah part

Depth (inches)	Percent Passing Sieve No.				Atterbert Limits		Unified Soil Classification System	Shrink Swell Potential
	4	10	40	200	LL	PI		
0-10	95-100	90-100	60-80	30-40	20-30	NP-5	SM	Low
10-22	95-100	80-100	50-75	15-30	10-20	NP-5	SM	Low
22-48	95-100	75-100	40-65	25-45	20-40	10-20	SC	Low
48-60	90-100	75-90	30-45	10-25	15-25	5-10	SM-SC	Low

Crowfoot Part:

Depth (inches)	Percent Passing Sieve No.				Atterbert Limits		Unified Soil Classification System	Shrink Swell Potential
	4	10	40	200	LL	PI		
0-10	85-100	75-100	40-60	25-40	20-30	NP-5	SM	Low
12-23	85-100	75-100	35-55	15-30	NV	NP	SM	Low
23-36	85-100	75-100	60-85	45-55	30-40	10-20	CL,SC	Mod
36-60	75-100	65-90	25-60	15-30	NV	NP	SM	Low

FIGURES



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VICINITY MAP
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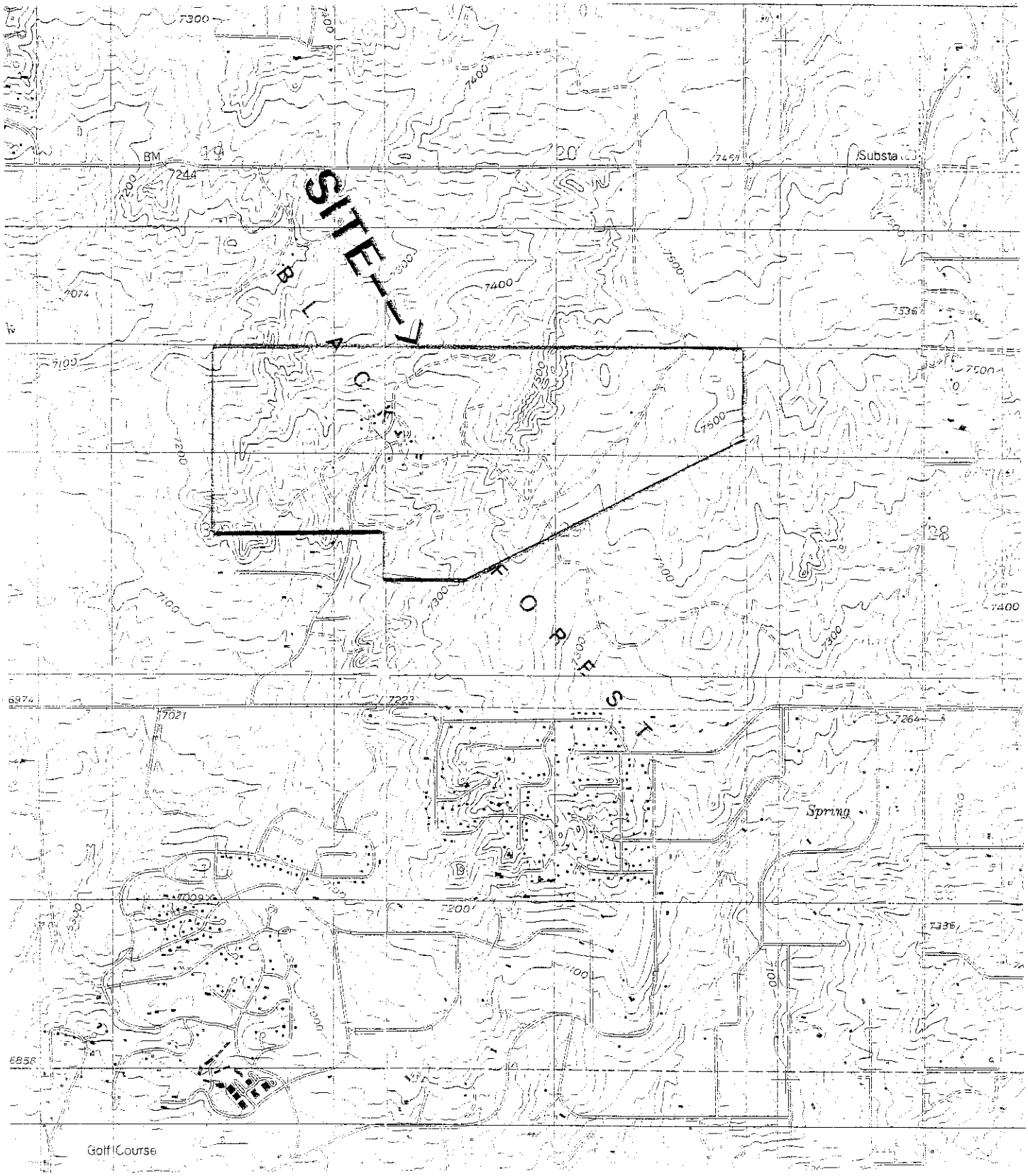
R. OLSON	31MAY05		

JOB NO.: 51175

FIG NO.: 1



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USGS MAP
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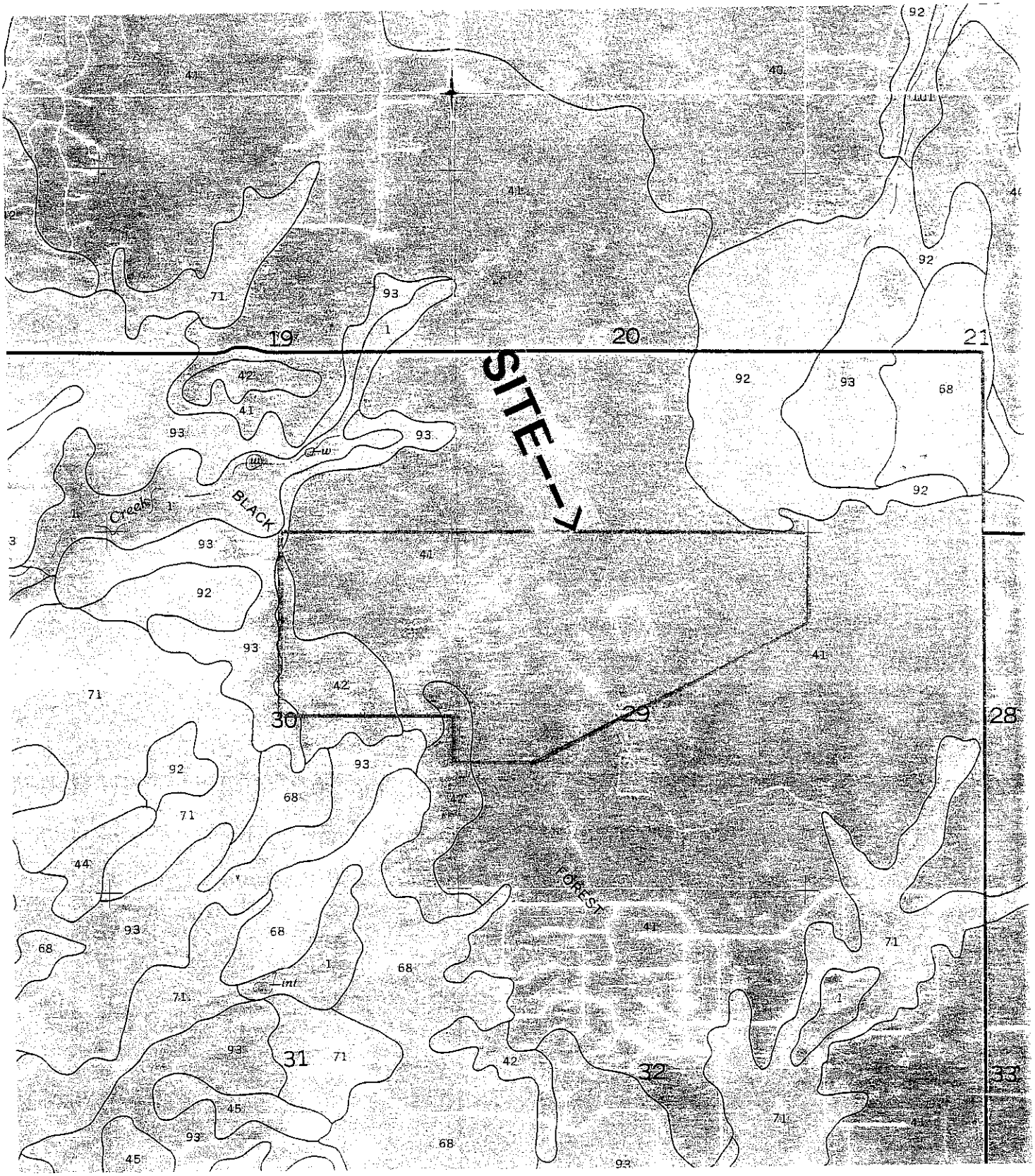
FIG NO.: 2



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SCS MAP
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FIG NO.: 3

41—Kettle gravelly loamy sand, 8 to 40 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Elbeth sandy loam, 8 to 15 percent slopes; Pring coarse sandy loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have formed in drainageways.

The soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for this use is the moderate hazard of erosion. Measures must be taken to reduce erosion when harvesting timber, especially on the steeper slopes. The low to moderate available water capacity also influences seedling survival, especially in areas where understory plants are plentiful.

This soil has good potential for mule deer, tree squirrel, cottontail, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

The moderately sloping to steep slopes limit the suitability of this soil for homesites. Special practices must be provided to minimize surface runoff and thus keep erosion to a minimum. This soil requires special site or building designs because of the slope. Deep cuts, to provide essentially level building sites, may expose bedrock. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and keep soil losses to a minimum. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

42—Kettle-Rock outcrop complex. This gently rolling to very steep complex, is mostly on the side slopes of uplands. Slopes range from 8 to 60 percent. Elevation ranges from 6,800 to 7,700 feet. The average annual precipitation is about 18 inches, and average annual air temperature is about 42 degrees F.

The Kettle soil makes up about 60 percent of the complex, Rock outcrop about 20 percent, and other soils about 20 percent.

Included with this complex in mapping are areas of Peyton-Pring complex, 8 to 15 percent slopes; Elbeth sandy loam, 8 to 15 percent slopes; and Elbeth-Pring complex, 5 to 50 percent slopes.

The Kettle soil is deep and well drained. It formed in sandy arkosic deposits, mostly on the lower slopes of the complex. Slope is commonly less than 20 percent. Typically, the surface layer is gray, medium acid or slightly acid gravelly loamy sand about 3 inches thick. The subsurface layer is light gray, medium acid gravelly loamy sand about 13 inches thick. The subsoil is very pale brown, medium acid or slightly acid gravelly sandy loam about 24 inches thick. It consists of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Permeability of the Kettle soil is rapid. Effective rooting depth is more than 60 inches. Available water capacity is low to moderate. Surface runoff is medium to rapid, and the hazard of erosion is slight to high. Soil slippage and deep gullies are common.

Rock outcrop is mostly in the form of vertical cliffs. Large stones are common on the lower slopes of this complex.

This complex is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation of this complex for this use is the presence of Rock outcrop and the moderate hazard of erosion on the Kettle soil. Measures must be taken to minimize erosion when harvesting timber, especially on the steeper slopes. The low to moderate available water capacity also influences seedling survival, especially where understory plants are plentiful.

This complex has good potential for producing habitat for mule deer, tree squirrels, cottontail, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

The moderate to very steep slopes limit the potential of this complex for homesites. Special practices must be provided to minimize surface runoff and thus keep erosion to a minimum. Special site or building designs are required because of the slope. Deep cuts, to provide essentially level building sites, can expose bedrock. The limitation of large stones on the soil surface can be overcome through the use of heavy equipment when preparing building sites. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and thus keep soil losses to a minimum. Deep cuts along the uphill side of the roads can expose the bedrock. Capability subclass VIIe.

93—Tomah-Crowfoot loamy sands, 8 to 15 percent slopes. These moderately sloping to strongly sloping soils are on alluvial fans, hills, and ridges in the uplands. Elevation ranges from about 7,300 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

The Tomah soil makes up about 50 percent of the complex, the Crowfoot soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Elbeth sandy loam, 8 to 15 percent slopes; Peyton-Pring complex, 8 to 15 percent slopes; and Kettle gravelly loamy sand, 8 to 40 percent slopes.

The Tomah soil is deep and well drained. It formed in alluvium or residuum derived from arkose beds. Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is very pale brown coarse sand about 12 inches thick. The subsoil, about 26 inches thick, consists of a matrix of very pale brown coarse sandy clay loam. The substratum is very pale brown coarse sand to a depth of 60 inches or more.

Permeability of the Tomah soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The Crowfoot soil is deep and well drained. It formed in sediment weathered from arkosic sandstone. Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsurface layer is very pale brown sand about 11 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The substratum is very pale brown coarse sand to a depth of about 68 inches.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The soils in this complex are used as rangeland, for recreation and wildlife habitat, and as homesites.

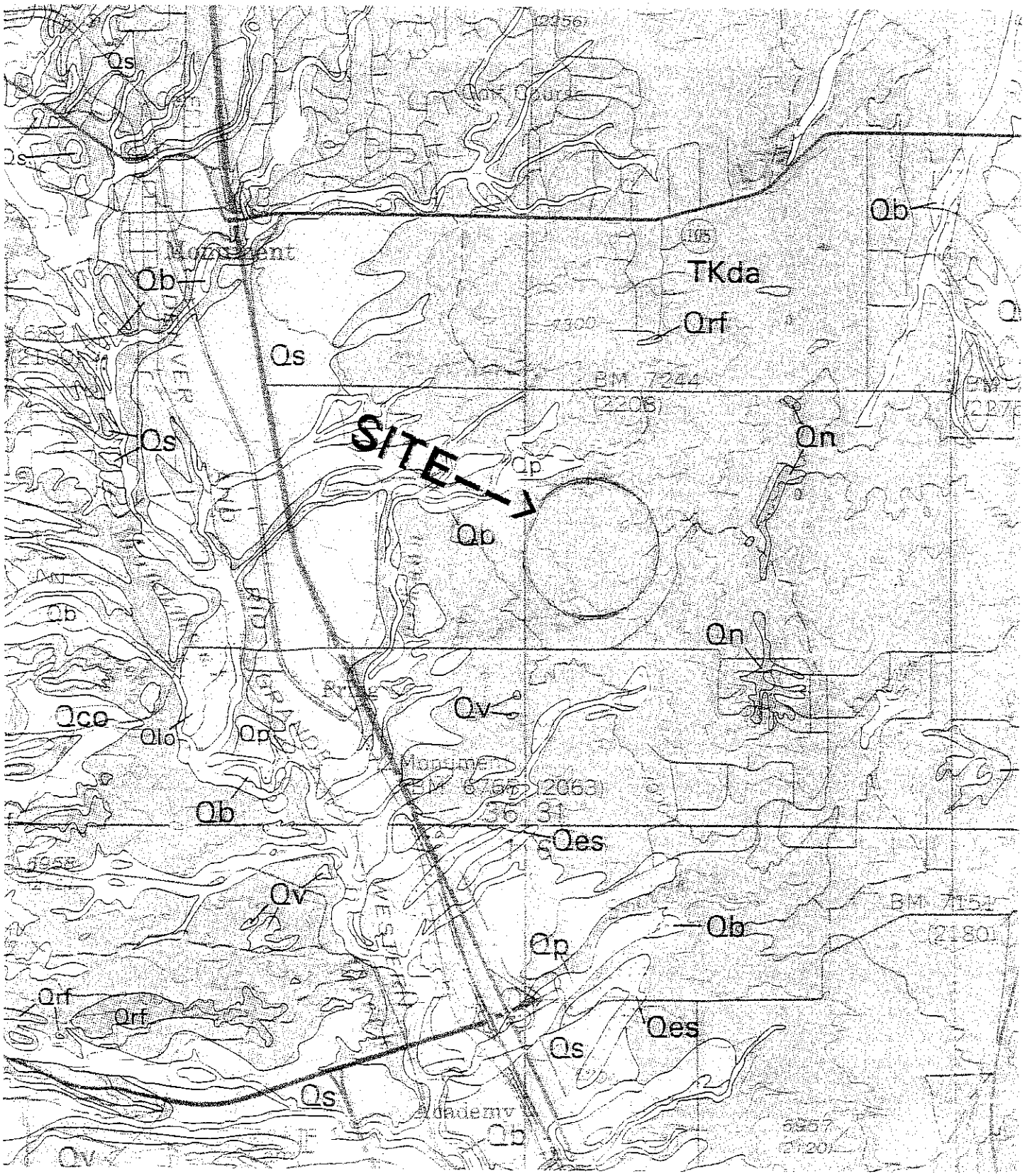
Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the main limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife species, such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

The main limitations for urban uses are frost-action potential and slope on the Crowfoot soil and slope on the Tomah soil. Buildings and roads must be designed to overcome these limitations. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass VIe.



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FRONT RANGE GEOLOGY MAP
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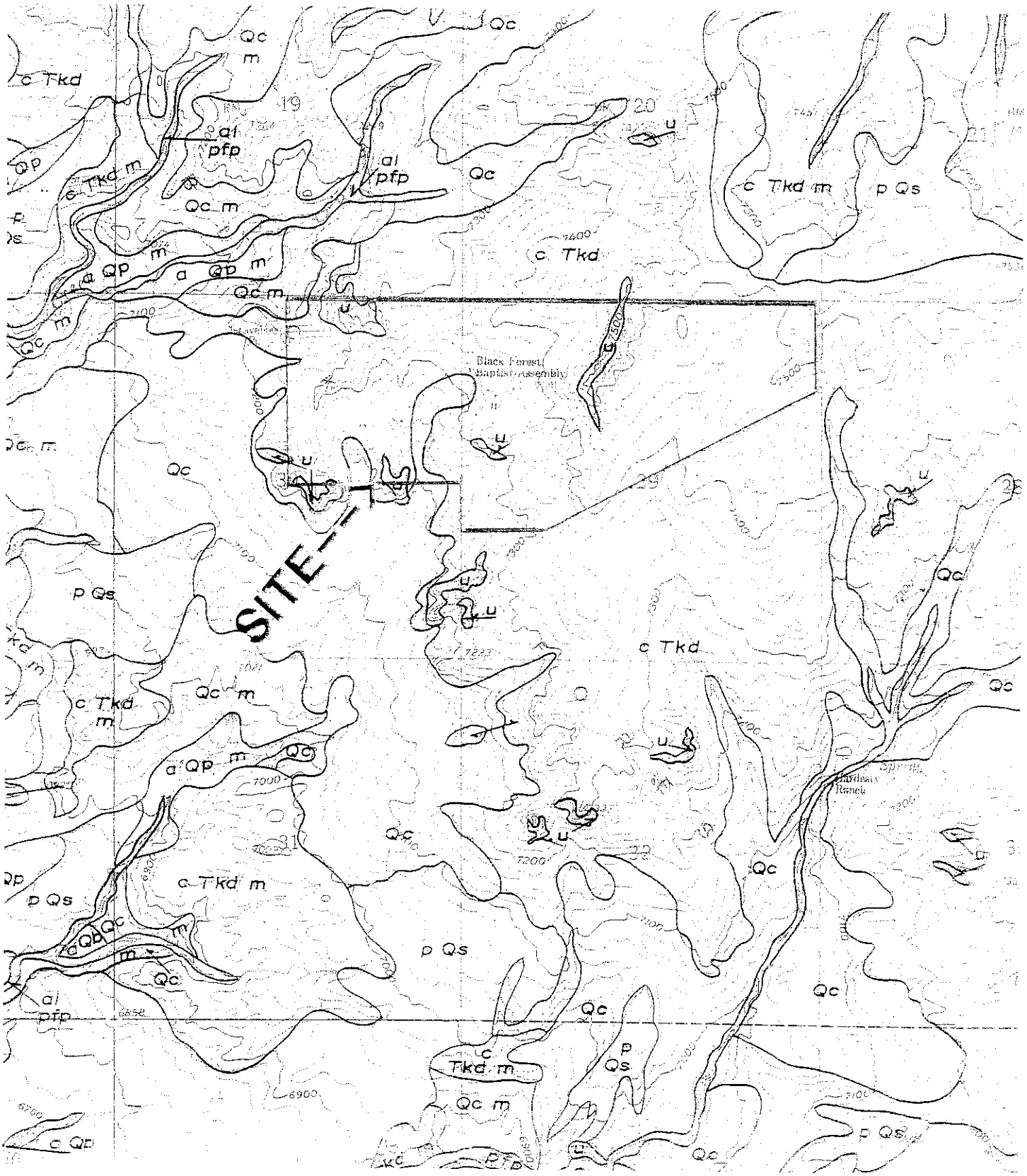
FIG NO.: 7



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ROBINSON MONUMENT QUADRANGLE
GEOLOGY MAP
BAPTIST CHRUCH PARCEL
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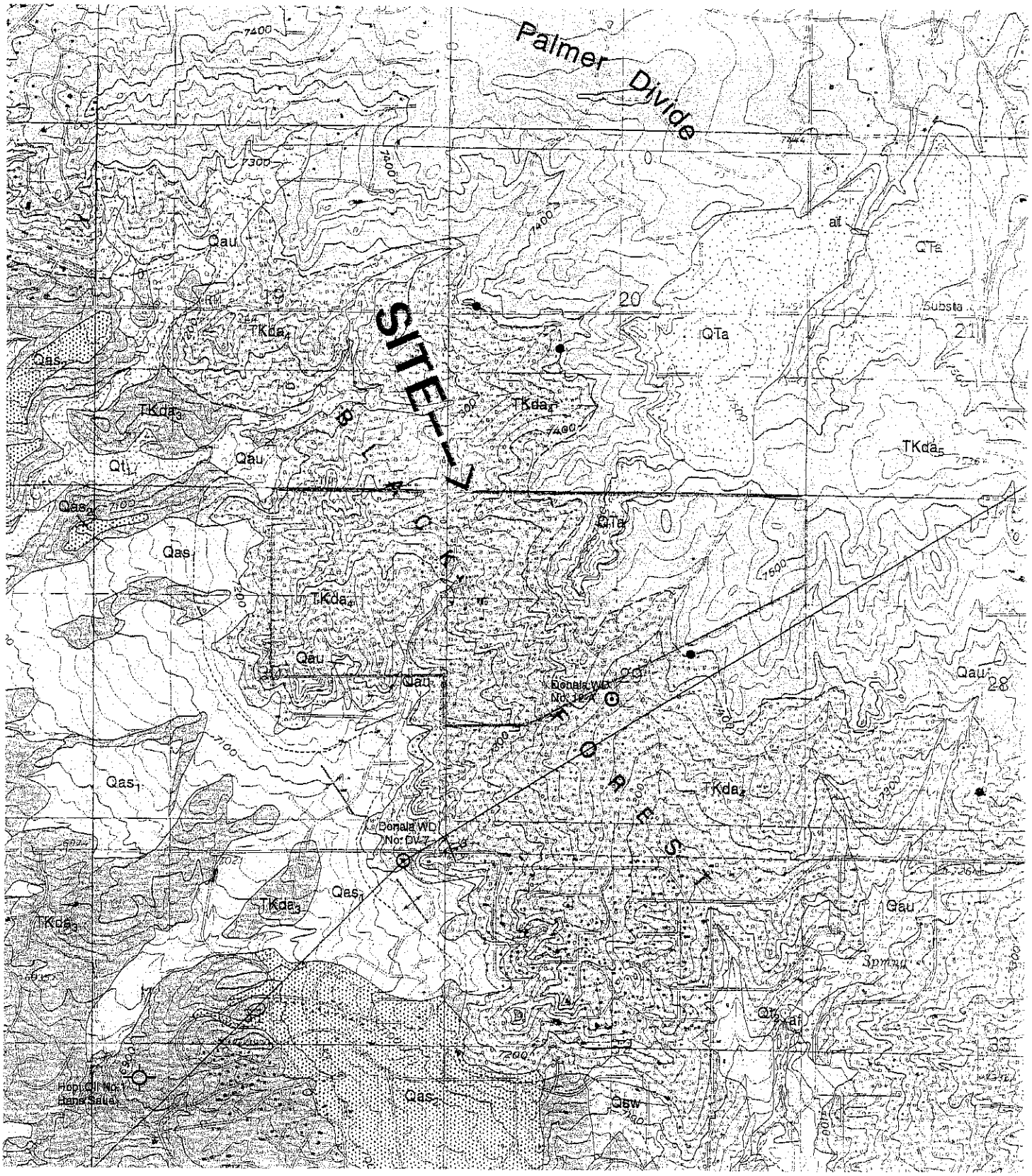
FIG NO.: 8



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CGS MONUMENT QUADRANGLE
GEOLOGY MAP
BAPTIST CHRUCH PARCEL
COLORADO SPRINGS, CO.
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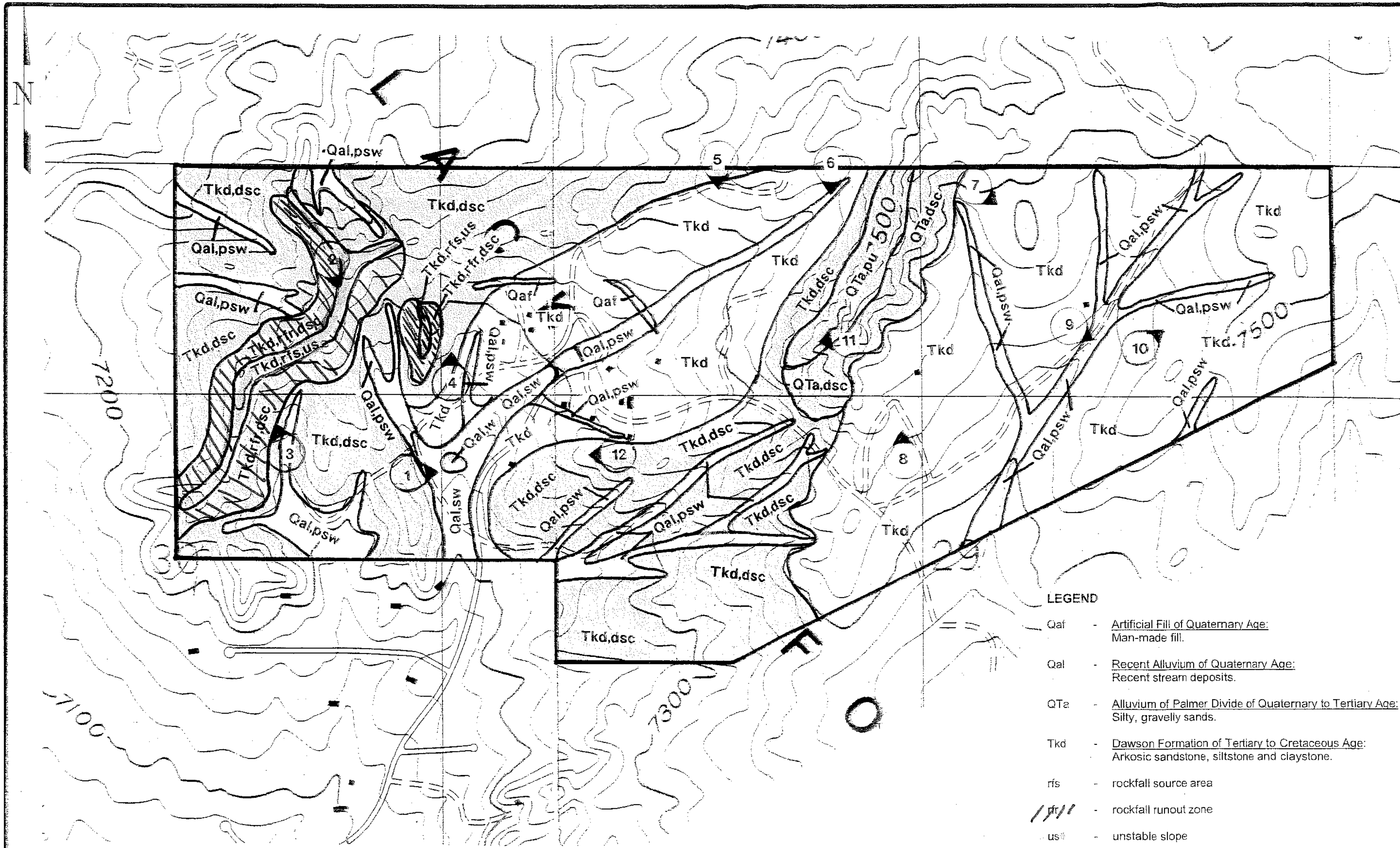
FIG NO.: 9



LEGEND

Qaf - Artificial Fill of Quaternary Age: Man-made fill.

Qal - Recent Alluvium of Quaternary Age: Recent stream deposits.

QTa - Alluvium of Palmer Divide of Quaternary to Tertiary Age: Silty, gravelly sands.

Tkd - Dawson Formation of Tertiary to Cretaceous Age: Arkosic sandstone, siltstone and claystone.

rfs - rockfall source area

rfr - rockfall runout zone

us - unstable slope

pu - potentially unstable slopes

dsc - downslope creep areas

w - area of ponded water

psw - potentially seasonal shallow groundwater area

sw - seasonal shallow groundwater area

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GEOLOGY/ ENGINEERING GEOLOGY MAP
BAPTIST CHRUCH PARCEL
COLORADO SPRINGS, CO.
FOR: CLASSIC COMMUNITIES

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SCALE N.T.S.
JOB NO. 51175
FIGURE No. 10

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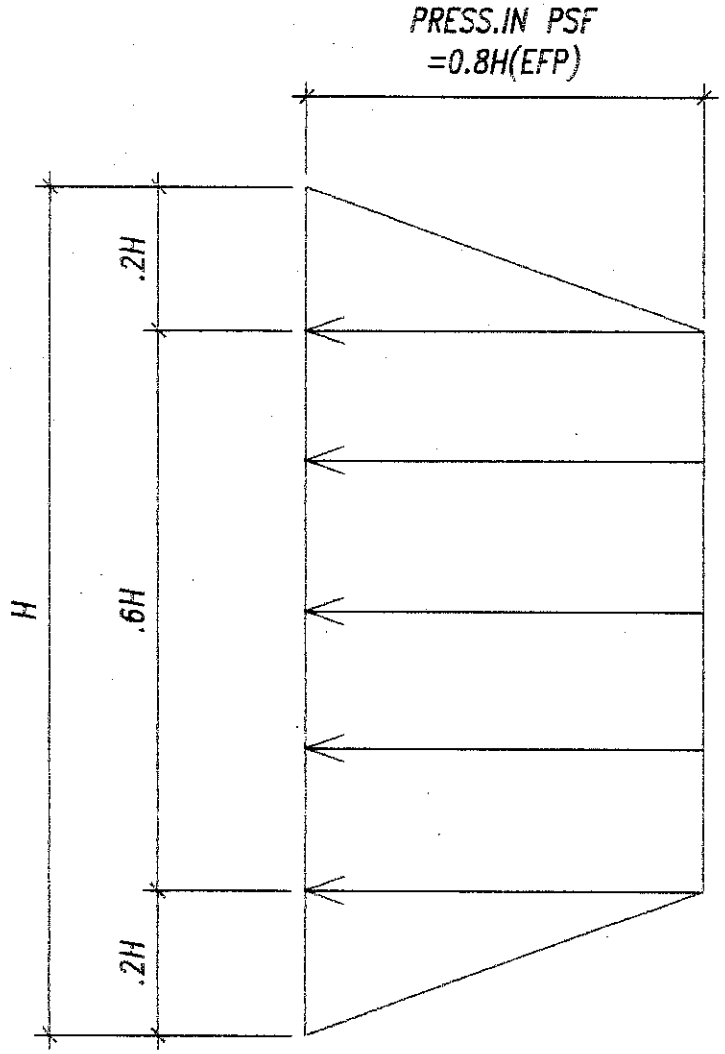

PRESSURE DISTRIBUTION

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SCALE: NTS
JOB NO: 5175
FIGURE No.: 11

LATERAL PRESSURE DISTRIBUTION
AREA WITH CREEP

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LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

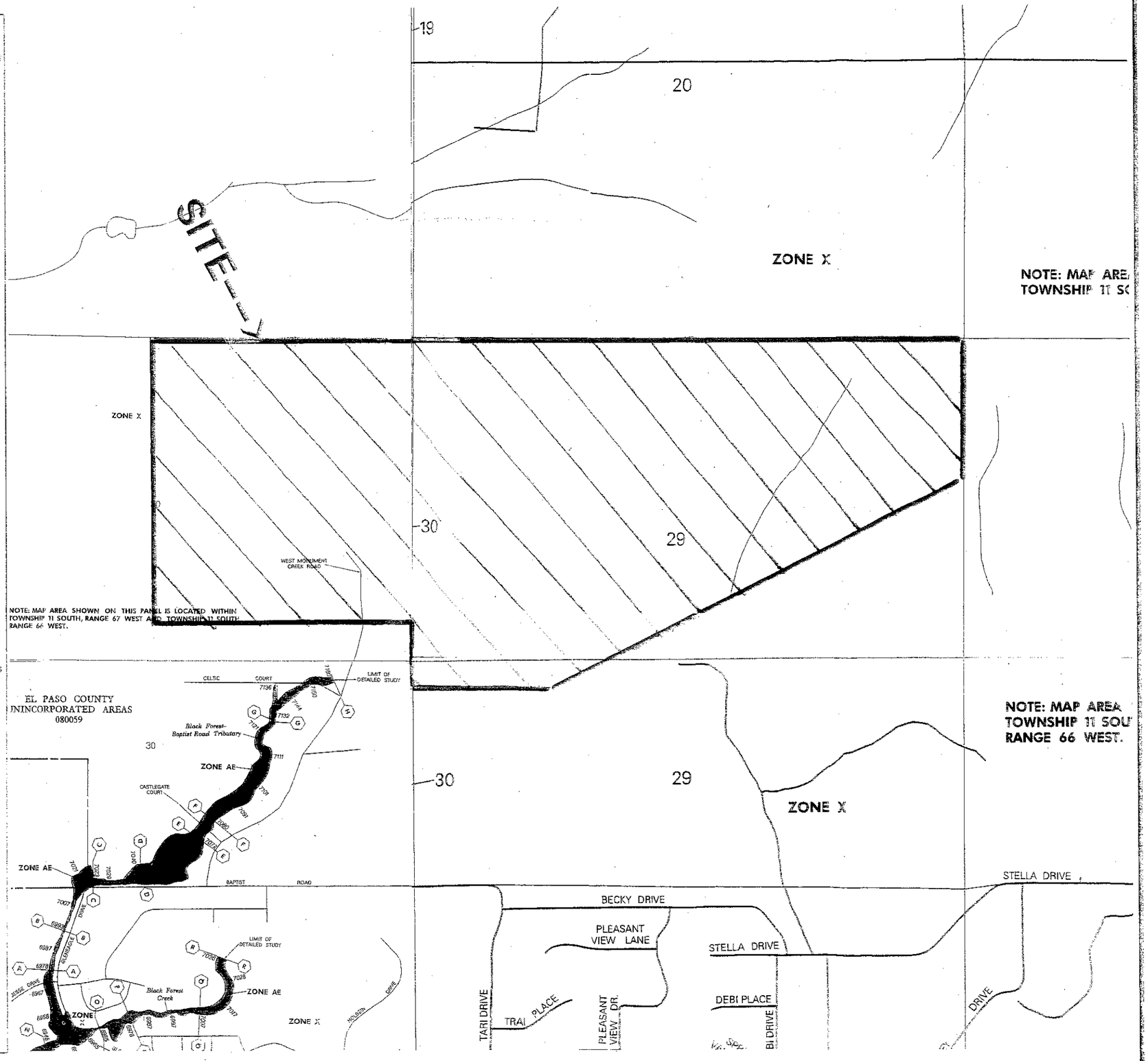
D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 × — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.



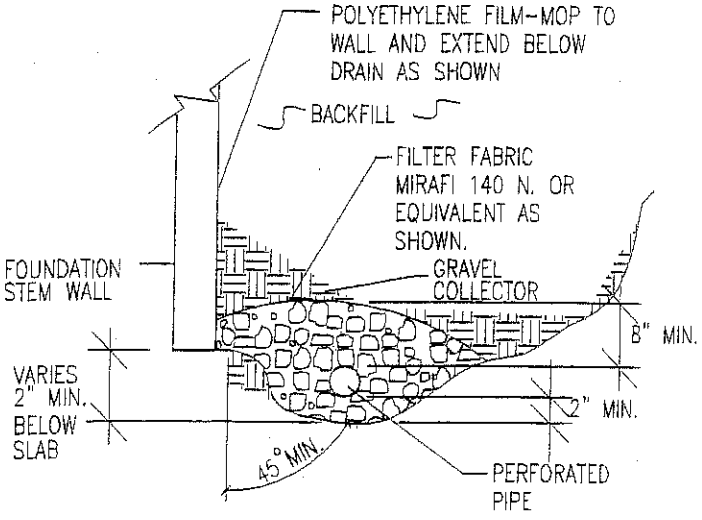
REVISION	BY

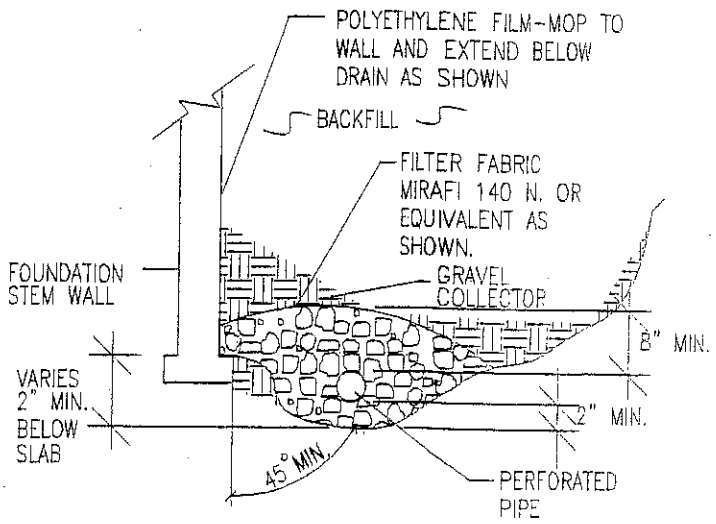
ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907
(719) 531-5599

FLOODPLAIN MAP
BAPTIST CHRUCH PARCEL
COLORADO SPRINGS, CO.
FOR: CLASSIC COMMUNITIES

DRAWN	R. OLSON
CHECKED	
DATE	31MAY05
SCALE	AS SHOWN
JOB NO.	51175
FIGURE No.	2

M:\2005\GEOHAZ MAPS\51175\BAPTIST CHURCH PARCEL.RPT SET.dwg, 5/31/2005 3:43:48 PM, 1:1





NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS-85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4-INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON-PERFORATED PIPE.

-FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

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COLORADO SPRINGS, CO. 80907 (719) 531-5599

PERIMETER DRAIN DETAIL

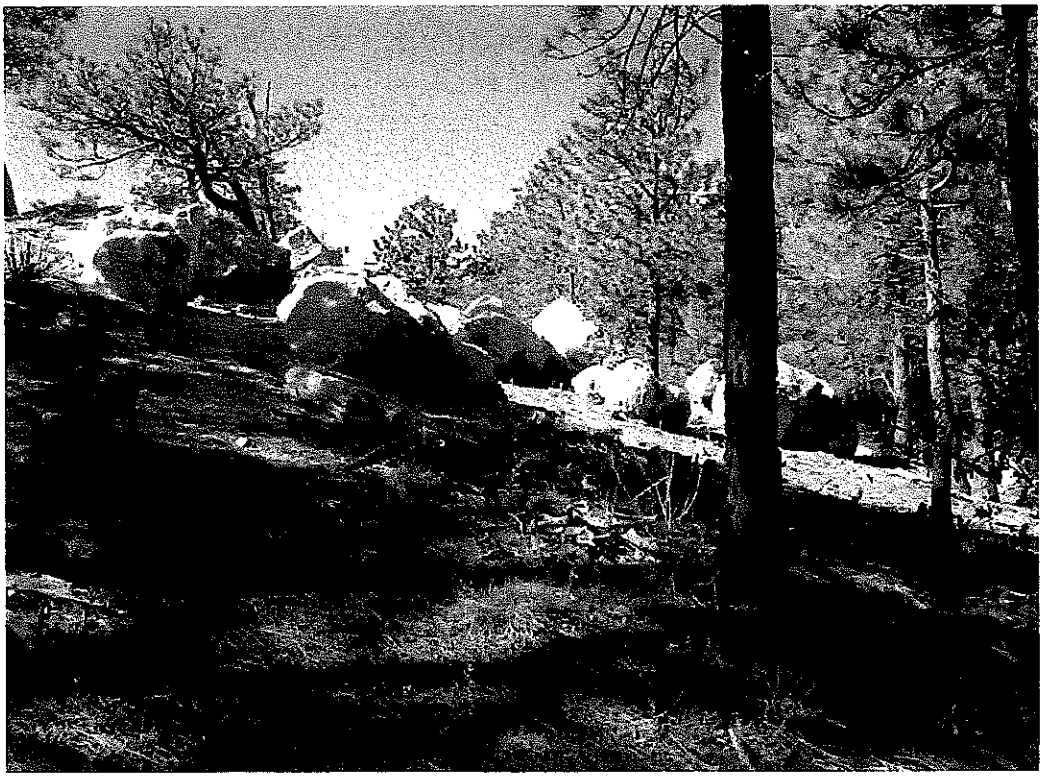
DRAWN:	DATE:	DESIGNED:	CHECKED:
R.J. OLSON			

JOB NO.: 5175
FIG NO.: 12

APPENDIX: Site Photographs

1

Looking east at ponded area.

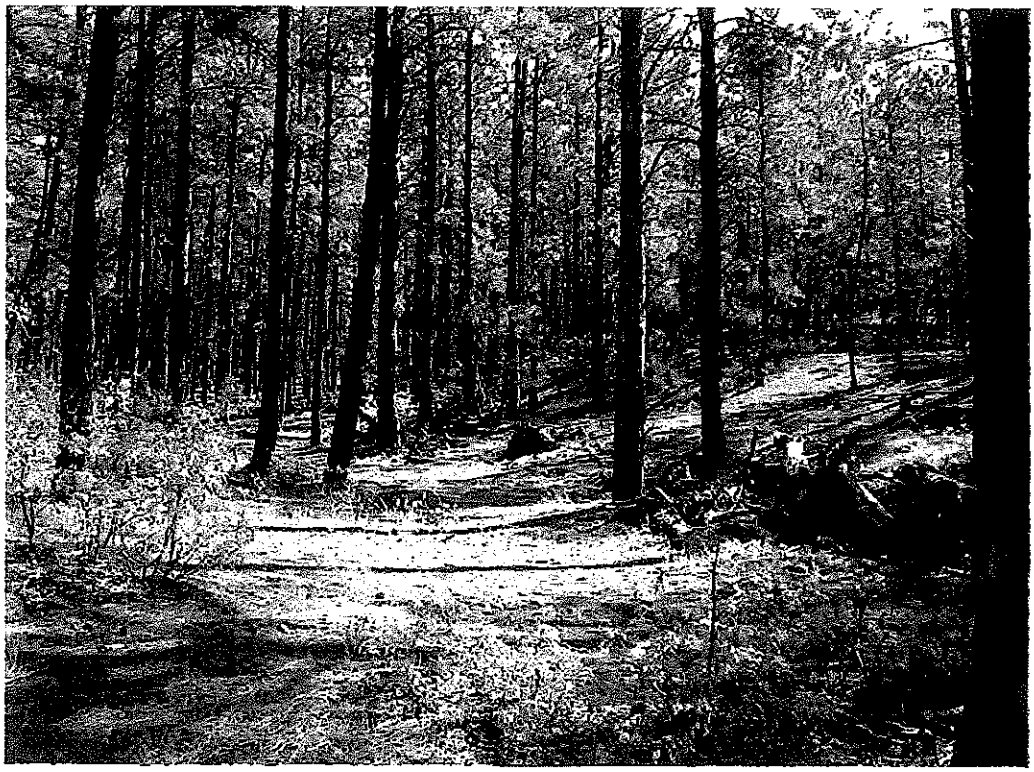


2

Looking south at rockfall areas in northwest portion of site.

3

Looking northwest from west-central portion of site.



4

From west-central portion of site, looking northeast.

5

From north-central portion of site, looking south.

6

From north-central portion of site looking south.

7

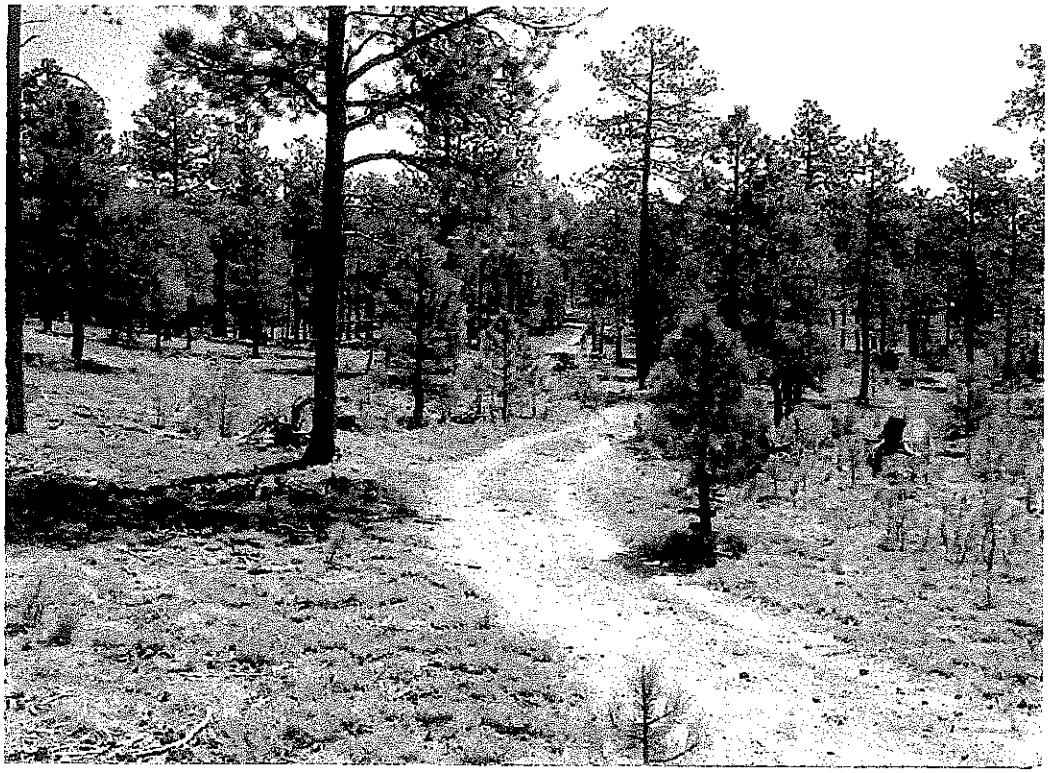
From northeast portion of site, looking southeast.

8

From southeast portion of site, looking north.

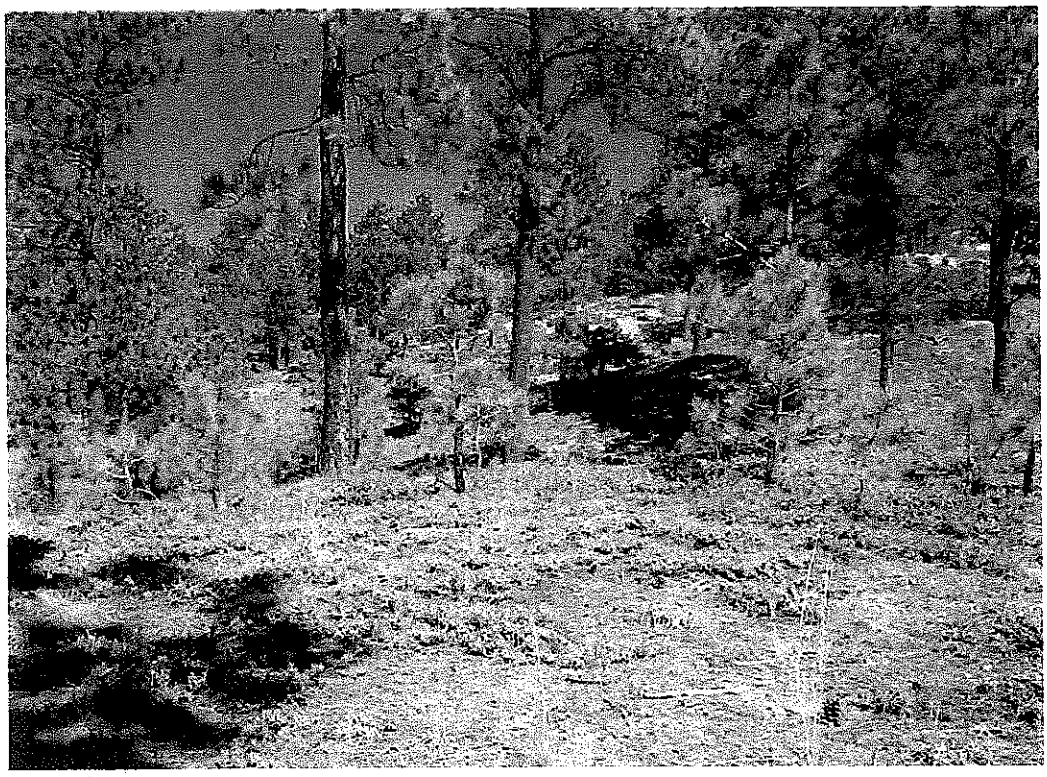
9

From east-central portion of site looking southeast.



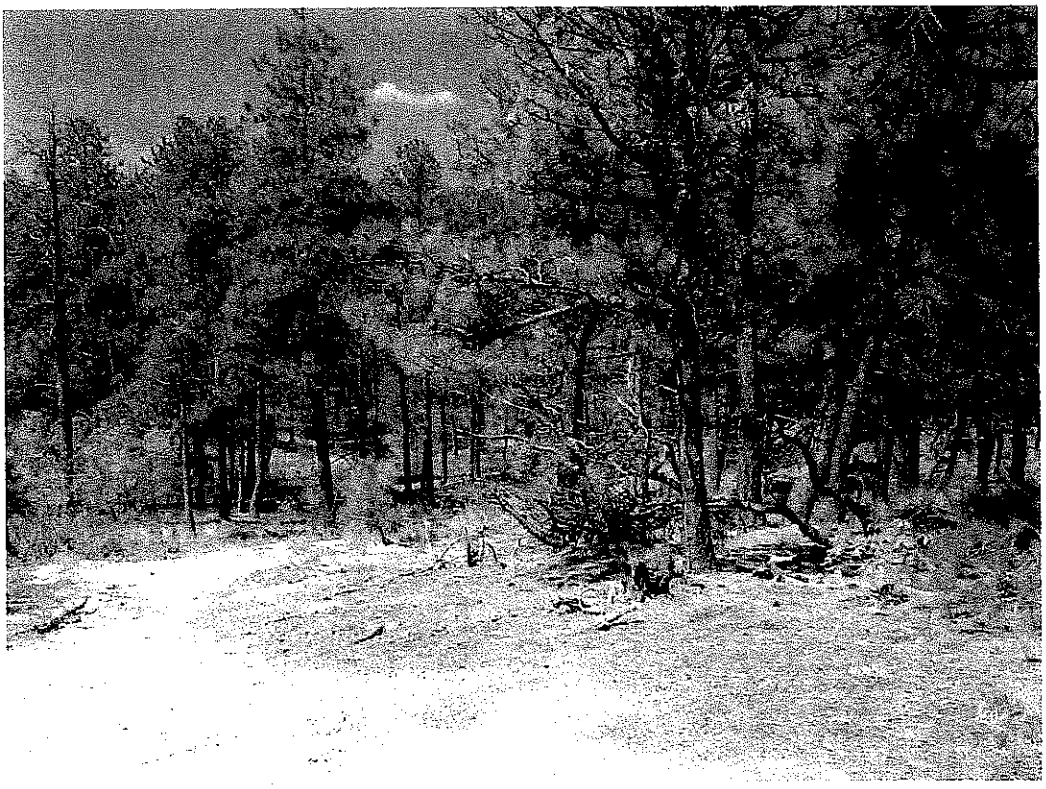
10

From east-central portion of site, looking northeast.



11

From north-central portion of site, looking west.



12

From south-central portion of site looking west.