

CITY OF MURRIETA



GRADING  
MANUAL

DEPARTMENT OF PUBLIC WORKS

Resolution No. 93-206

Adopted May 4, 1993  
1<sup>st</sup> Revision: February 7, 2005

CITY OF MURRIETA  
GRADING MANUAL

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SUBARTICLE 1. GENERAL PROVISIONS

1.1 Authority

The Grading and Excavation Code Section 8.12.100.801, Grading manual, authorizes the City Engineer, to formulate such rules, procedures and interpretations as may be necessary or convenient to administer the Grading Code. Such rules, procedures and interpretations, and amendments thereto shall be referred to as the City of Murrieta Grading Manual upon approval by the City Council.

1.2 Scope and Purpose

The City of Murrieta Grading Manual (hereinafter referred to as Grading Manual) is a compilation of rules, procedures and interpretations necessary to carry out the provision of the City of Murrieta Grading and Excavation Code which regulates grading on private property in the incorporated area of the City of Murrieta. The grading manual is organized to follow the content of sub articles in the grading code.

The purpose of the grading manual is to assist users of the grading code by supplementing it with detailed information regarding rules, interpretations, standard specifications, procedures, requirements, forms and other information applicable to control excavation, grading and earthwork construction. Should any portion of the grading manual be found to be in conflict with the provisions of the grading code, the code provision shall govern.

1.3 Adoption and Revision

The provisions of the grading manual including revisions or additions thereto, shall be prepared by the City Engineer, and shall become effective upon being approved by the City Engineer.

SUBARTICLE 2. DEFINITIONS

2.1 Definitions

The definitions contained in this sub article are supplemental to those contained in the grading code.

AS-GRADED is the surface conditions extant on completion of grading.

BEDROCK is relatively unweathered, consolidated or relatively hard formation that underlies the soil and other unconsolidated material.

BENCH is a relatively level step excavated into earth material on which fill is to be placed.

EARTH MATERIAL is any rock, natural soil or fill and/or any combination thereof.

FAULT is a fracture in the earth's crust along which movement has occurred. A FAULT is considered active if surface or near surface rupture has likely occurred within the last  $\pm$  11,000 years (Holocene geologic time).

FLATLAND SITE is any site which does not fit the definition of a hillside site.

HILLSIDE SITE is a site where the existing grade is 20 percent (%) or greater and which may be adversely affected by drainage and/or stability conditions within or from outside the site or which may cause an adverse affect on adjacent property.

KEY is a designed compacted fill placed in a trench excavated in earth material beneath the toe of a proposed fill slope.

KEYWAY is an excavated trench into competent earth material beneath the toe of a proposed fill slope.

RETAINING WALL is a wall designed to resist the lateral displacement of soil or other materials.

#### MANUFACTURED SLOPE STABILITY

GROSS SLOPE STABILITY--is the stability of slope material below a plane approximately 3 to 4 feet deep measured from and perpendicular to the slope face.

SURFICIAL SLOPE STABILITY--is the stability of the outer 3 to 4 feet of slope material measured from perpendicular to the slope face.

#### NATURAL SLOPE STABILITY

LANDSLIDE is a perceptible downslope movement of rock, soil, or artificial fill ranging in speed from moderately slow (slump) to very rapid (avalanche).

MUD or DEBRIS FLOW is soil or soil-rock debris moving as a viscous fluid or slurry, usually terminating at distances far beyond the failure zone; resulting from excessive pore pressures.

SULFATE (SO<sub>4</sub>) is a chemical compound occurring in some soils which, at above certain levels of concentration, has a corrosive effect on ordinary portland cement concrete and some metals.

### SUBARTICLE 5. GRADING PERMIT REQUIREMENTS

#### 5.1 Grading Permit Application

A grading permit application shall consist of the following items and forms completed and signed by the applicant or his representative unless otherwise specified by the City Engineer:

- a. Application form.
- b. Four sets of grading plans. (Five sets if commercial/industrial)
- c. Geotechnical certification.
- d. Two copies of a preliminary soil report.

- e. Two copies of a preliminary hydrology report (if required).
- f. Payment of grading plan check fee.
- g. Four sets of erosion control plans.

## 5.2 Grading Plan Clearances

Prior to issuance of a grading permit, written clearance will be required from other agencies. Depending on site conditions and location, written clearance or permits may be required from, but not limited to, the following agencies:

- a. California State or Regional Water Quality Control Board
- b. California Department of Fish and Game
- c. Riverside County Flood Control District
- d. California Division of Industrial Safety
- e. Murrieta Fire Protection District (fuel modification)
- f. United States Army Corps of Engineers

Upon notification, the applicant shall be responsible for submitting copies of the grading plans and information required by those divisions or agencies and obtaining the required clearance or permits.

## 5.3 Grading Plan Check

Information on Plans and Specifications: Plans submitted for plan check shall be drawn to minimum scale of 1" = 40', ink on mylar unless prior approval is received from the City Engineer and shall be of sufficient clarity to indicate the nature and extent of the work proposed and show in detail that they will conform to the provisions of this grading manual, the Grading and Excavation Code, and all relevant laws, ordinances, rules and regulations.

The first sheet of each set of plans shall give the location of the work and the name and address and telephone number of the owner, the person by whom they were prepared, the project soil engineer, engineering geologist and, when required, the project paleontologist and archaeologist. Plan dimension shall be 24" x 36".

### a. Rough Grading Plan:

The plans shall include but not be limited to the following information:

1. Vicinity map of the site.
2. Property limits clearly labeled or otherwise identified and accurate contours of existing ground and details of terrain and area drainage a minimum of fifteen (15) feet beyond property limits (spot elevations may be used on flatland sites).
3. Prominent existing or natural terrain features.
4. Limiting dimensions including setbacks between property lines and top and toe slopes, elevations of finish contours to be achieved by the grading, proposed drainage devices and related construction.
5. Details (plan and section) of all surface and subsurface drainage devices, walls,

cribbing, dams and other protective devices to be constructed with, or as a part of the proposed work together with a map showing the drainage area and estimated runoff from the area served by any drains.

6. Location of any existing building or structures on the property where the work is to be performed and the location of any buildings or structures on land of adjacent owners which are within fifteen (15) feet of the property, or which may be adversely affected by the proposed grading operations.
7. If the grading project includes the movement of earth material to or from the site in an amount considered substantial by the City Engineer, the permittee shall submit the haul route for review and approval by the Traffic Engineer prior to the issuance of a grading permit. The Traffic Engineer may suggest alternate routes or special requirements in consideration of the possible impact on the adjacent community environment or effect on the public right-of-way itself, which the City Engineer shall prescribe as a condition of the grading permit. There shall be no additional fee for the haul route plan check.
8. Additional plans, drawings, calculations, environmental impact information, or other reports required by the City Engineer.

b. Precise Grading Plan:

The plans shall include the following in addition to the above items listed for Rough Grading Plans:

1. The footprint or allowable building area of all proposed structures (including appurtenances).
2. Setback distances between structures and top and toe of slopes.
3. Detailed finish grade and finish floor elevations.
4. Flowlines for lot drainage.
5. Details for building footing and side-yard swale relationship (including extra-height of footing).
6. All proposed concrete flatwork and/or driveways.

The Precise Grading Plan shall identify all previous rough grading plans issued for the project site. It may include sheets from the rough grading plan which show original topography in lieu of reproducing original contours on the precise plan.

c. Grading Plan Correction List:

A Grading Plan Standards and Correction Sheet is included in Appendix "A" which identifies additional items typically required on grading plans depending on site conditions.

#### 5.4 Soil and Engineering Geology Report Content



Two copies of each report required in this section shall be submitted as part of the application for grading permit. Each report shall contain all information applicable to the project to include all "standard of practice/care" technical assessments, particularly those relating to specific geologic conditions that may constrain the grading/development within the City of Murrieta. Guidelines are provided in Appendix B, "Technical Guidelines for Soil and Geology Reports." All reports shall be signed and sealed by the engineer/architect of work.

Recommendations contained in the approved reports shall be incorporated into the grading plans and specifications and shall become conditions of the grading permit.

a. Preliminary Soil Report:

**Preliminary soil engineering reports shall be required for all grading projects.**

The preliminary (initial) soil engineering report shall include information and data regarding the nature, distribution, and the physical and chemical properties of existing soils; an opinion as to the potential and amount of primary consolidation and secondary compression, hydrocollapse, angular distortion, differential settlement, potential for liquefaction with supporting data and/or calculations; conclusions as to adequacy of the site for the proposed grading; recommendations for general and corrective grading procedures; foundation and pavement design criteria and shall provide other recommendations, as necessary, commensurate with the project grading and development.

b. Preliminary Engineering Geology Report:

Engineering geology reports shall be required for all developments where geologic conditions are considered to have a substantial effect on existing and/or future site stability. This requirement may be extended to other sites suspected of being potentially adversely affected by faulting, fissuring, or differential settlement.

The preliminary (initial) engineering geology report shall include a comprehensive description of the site topography and geology; an opinion and supporting technical data as to the adequacy of the proposed development from an engineering geologic standpoint; an opinion and supporting technical data as to the potential for hydrocollapse to occur should the water table rise; an opinion and supporting technical data as to the potential for differential settlement and fissuring from ground water pumping; an opinion as to the presence of steep subsurface geologic contacts that may contribute to fissuring; an opinion and supporting technical data concerning the potential for onsite faulting or liquefaction; an opinion as to the extent that instability on adjacent properties may adversely affect the project; an opinion and supporting technical data concerning the potential for debris flows or mud flows engendered by regional landuse changes; a description of the field investigation and findings; conclusions regarding the effect of geologic conditions on the proposed development; and specific recommendations for plan modification, corrective grading and/or special techniques and systems to facilitate a safe and stable development, and shall provide other recommendations as necessary, commensurate with the project grading and development. The preliminary engineering geology report may be combined with the soil engineering report.

c. Seismicity Report:

A seismicity report shall be required as a condition for issuance of a grading permit and/or Building Permit for all subdivisions (tracts); and all sites for critical structures as defined in the UBC and major structures, as determined by the City Engineer or Building Official. Additionally sites containing earthquake sensitive earth materials and/or sites that are located on or near potentially active or active faults as defined or identified by the State of California, the County of Riverside, the City of Murrieta or the consultant geologist employing at least the minimum "standard of practice/care" investigative techniques shall also require a seismicity report, as determined by the City Engineer or Building Official.

The report shall be prepared by a State of California licensed/certified engineering geologist, geophysicist, or a soil engineer with expertise in earthquake technology and its application to building and other civil engineering works. The scope of the report shall be commensurate with the proposed development and shall reflect the standard of practice/care. The seismic report may be combined with the soil and engineering geology reports.

d. Final Reports:

Rough grade and final soil and engineering geology reports shall be submitted in accordance with Subarticle 15 of this grading manual.

5.5 Permit Issuance

For subdivisions, a grading permit may be issued for a project after the approval of a Tentative Tract or Tentative Parcel Map. Grading permits subject to the above subdivision requirements shall not be issued prior to the approval of the Tentative Maps unless otherwise provided in Zoning regulations or approved by the City Engineer.

## SUBARTICLE 6. FEES

6.1 Plan Checking Fees

All fees for the grading on each site shall be in conformance with the City's Fee Ordinance.

Erosion control plans checked subsequent to grading permit issuance shall be treated as a substantial revision for the purpose of determining plan checking fees.

6.2 Grading Permit Fee

Grading permit fees on each site shall be paid as authorized by City Council.

The fee for a minimum fee grading permit for inspection purposes only, described in Section 8.12.100.805 Grading Permits, of the grading code shall be based on 100 cubic yards of excavation plus the estimated value of onsite drainage improvements to be inspected.

The fee(s) for authorizing additional grading work to that under a valid grading permit including erosion control work shall be computed as specified in the City's Fee Ordinance. No allowance for reduced earthwork volume or valuation shall be permitted.

### 6.3 Grading Permit Renewal Fee

The fee for renewing an expired or invalid grading permit shall be as specified in Section 8.12.100.818, Issuance, Expiration and Renewal, of grading code.

### 6.4 Reinspection Fee

When any reinspection is required due to the negligence of the permit holder, his agent or other responsible persons, or due to the failure of said parties to comply with previous correction instructions, a fee as established by resolution shall be charged by the City Engineer for each such reinspection. The fee shall be paid before any further inspections are made.

This subsection is not to be interpreted as requiring reinspection fees the first time a job is rejected for failure to comply with the requirements of this Manual, but as controlling the practice of calling for inspection before the job is ready for such inspection or reinspection.

## SUBARTICLE 7. SECURITY FOR GRADING

### 7.1 Types of Security

In lieu of a surety bond, the applicant may file a cash deposit or a letter of credit from financial institutions subject to regulation by the State or Federal Government in an amount equal to that which would be required in the surety bond.

### 7.2 Security Amount

The amount of a security shall be based on 30% of the cost of the project cut or fill volume, whichever is greater, and 50% of the cost of the on-site, non-City maintained drainage improvements and 100% of the cost of erosion control facilities being constructed or installed under the permit.

The amount of security may also be increased by the City Engineer up to 100% of the cost of the total cut or fill volume, whichever is greater, and 100% of the drainage improvements and erosion control facilities if the potential hazards or nature of the project justifies such an increased amount.

### 7.3 Bond Conditions

Every security and agreement shall be made per standard forms contained in Appendix C or contain the conditions prescribed therein and be approved as to form by the City Attorney.

#### 7.4 Term of Security

The term of each security shall begin upon the date of permit issuance and shall remain in effect until the completion of the work to the satisfaction of the City Engineer.

#### 7.5 Substitution

A substitute bond may be filed in lieu of the above mentioned bonds and the City Engineer may accept the same if it is suitable to insure completion of the work remaining to be performed and in proper form and substance.

### SUBARTICLE 8. CUTS

#### 8.1 Cut Slopes

Cut slopes shall be no steeper than two horizontal to one vertical (2:1).

### SUBARTICLE 9. FILLS

#### 9.1 Fill Location

Fill slopes shall not be constructed on natural slopes steeper than two (2) horizontal to one (1) vertical (2:1) or where the fill slope toes out within twelve (12) feet horizontally of the top of existing or planned cut slopes, outside the permit area boundary, except in the case of slopes approved by the geotechnical engineer and the City Engineer.

#### 9.2 Preparation of Ground

The ground surface shall be prepared to receive fill by removing vegetation; noncomplying fill; topsoil and other unsuitable materials; and by scarifying to provide a bond with the new fill. Where existing slopes exceed five (5) feet in height and/or are steeper than five horizontal to one vertical (i.e., 5:1), the ground shall be prepared by benching into sound bedrock or other competent material, as determined by the soil engineer and/or engineering geologist and approved by the City Engineer. The lowermost bench beneath the toe of a fill slope shall be a minimum ten (10) feet in width. The ground surface below the toe of fill shall be prepared for sheet flow runoff, or a paved drain shall be provided.

Where fill is to be placed over a cut slope, the bench under the toe of the fill shall be at least fifteen (15) feet wide, but the cut slope must be made before placing fill and shall meet the approval of the soil engineer and/or engineering geologist as suitable foundation for fill.

Unsuitable soil is soil which, is not dense, firm or unyielding, is highly fractured or has a high organic content and in the opinion of the City Engineer, civil engineer, soil engineer, or engineering geologist is not competent to support other soil or fill, to support structures or to satisfactorily perform the other functions for which the soil is intended.

### 9.3 Fill Material

Detrimental amounts of organic material shall not be permitted in fills. Except as outlined below, no rock or similar irreducible material with a maximum dimension greater than twelve (12) inches shall be buried or placed in fills.

The City Engineer may permit placement of larger rock when the soil engineer properly devises a method of placement, continuously inspects placement, and approves the fill stability and competency. The following conditions shall also apply:

- a. Prior to issuance of the grading permit, potential rock disposal area(s) shall be delineated on the grading plan.
- b. Rock sizes greater than twelve (12) inches in maximum dimension shall be ten (10) feet or more below grade, measured vertically. This depth may be reduced upon recommendation of the soil engineer and approval of the City Engineer providing that the permitted use of the property will not be impaired.
- c. Rocks greater than twelve (12) inches shall be placed so as to be completely surrounded by soils; no nesting of rocks will be permitted.

### 9.4 Compaction

All fills shall be compacted to a minimum of ninety (90) percent of maximum density as determined by Uniform Building Code Standard No. 70-1 or equivalent, as approved by the City Engineer. Field density shall be determined in accordance with the Uniform Building Code Standard No. 70-2, or equivalent, as approved by the City Engineer.

Locations of field density tests shall be determined by the soil engineer or approved testing agency and shall be sufficient in both horizontal and vertical placement to provide representative testing of all fill placed. Testing in areas of a critical nature or special emphasis shall be in addition to the normal representative samplings.

Exceptions:

- a. Fills excepted in Section 8.12.100.805, Grading Permits, of the Grading Code and where the City Engineer determines that compaction is not a necessary safety measure to aid in preventing saturation, settlement, slipping, or erosion.
- b. Where lower density and very high potential expansion characteristics as defined by table No. 29-C of the Uniform Building Code exist, lesser compaction may be granted by the City Engineer upon justification and recommendation by the soil engineer.

Fill slopes shall be compacted to the finish slope face as specified above. The soil engineer shall provide specifications for the method of placement and compaction of the soil within the zone of the slope face.

Sufficient maximum density determinations by test method, Uniform Building Code standard No. 70-1 or approved equivalent, shall be performed during the grading

operations to verify that the maximum density curves used are representative of the material placed throughout the fill.

#### 9.5 Slope

Fill slope shall be no steeper than two horizontal to one vertical (2:1) unless under three (3) feet or reinforced as approved by the City Engineer. In no case shall slopes steeper than 2:1 be approved if 2:1 or flatter slopes are required as a condition of approval of any project by the Planning Commission or the City Council without appropriate revision of said condition by the approving body.

Recommendations in the soil engineering report for fill slopes to be steeper than 2:1 shall be accompanied by a slope stability analysis for all slopes greater than five (5) feet in height. The soil engineer shall consider both the gross and surficial stability of the slope and provide a written statement approving the slope stability. In addition, the soil engineer shall recommend alternative methods of construction or compaction requirements necessary for surficial stability.

#### 9.6 Utility Line Backfill

Utility line backfill beneath and adjacent to structures; beneath pavements; adjacent and parallel to the toe of a slope; and in sloping surfaces steeper than ten horizontal to one vertical (10:1), shall be compacted and tested in accordance with subsection 9.4, Compaction, of this section. Alternately, relatively self-compacting material may be used. The material specification and method of placement shall be recommended and inspected by the soil engineer and approved by the City Engineer prior to backfilling.

Utility line backfill in areas other than those stated above need no specified placement method or compaction criterion, but shall require approval by the soil engineer.

The final utility line backfill report from the project soil engineer shall include an approval statement that the backfill is suitable for the intended use.

### SUBARTICLE 10. SETBACKS

#### 10.1 Setbacks from Permit Area Boundary

The tops of cuts and toes of fill slopes shall be setback as far as necessary from the outer property boundaries of the permit area, including slope easements, and in accordance with Detail 1.

#### 10.2 Design Standards for Setbacks

The tops and the toes of cut and fill slopes shall be set back from structures as far as is necessary for adequacy of foundation support and to prevent damage as a result of water runoff, erosion or maintenance of the slopes.

Unless otherwise approved by the City Engineer based on recommendations in the approved soil engineering and/or engineering geology report on the approved grading plan, setbacks shall be no less than shown in Detail 1.

### 10.3 Retaining Walls

Retaining walls may be used to reduce the required setback in accordance with Detail 1 when approved by the City Engineer.

## SUBARTICLE 11. DRAINAGE AND TERRACING

### 11.1 Terrace

Terraces at least six (6) feet in width shall be established at not more than thirty (30) foot vertical intervals on all cut or fill slopes to control surface drainage and debris, except that where only one (1) terrace is required, it shall be at mid-height. For cut or fill slopes greater than 60 feet and up to 120 feet in vertical height, one terrace at approximately mid-height shall be 12 feet in width. Terrace widths and spacing for cut and fill slopes greater than 120 feet in vertical height shall be designed by a professional engineer and approved by the City Engineer. Suitable access shall be provided to permit proper cleaning and maintenance.

Swales or ditches on 6 feet and 12 feet wide terraces shall have a minimum gradient of five (5) percent and must be paved with reinforced concrete, or approved equal, not less than three (3) inches in thickness.

A single run of swale or ditch shall not collect runoff from a tributary area exceeding 13,500 square feet (projected) without discharging into a down drain.

### 11.2 Subsurface Drainage

Cut and fill slopes shall be provided with approved subsurface drainage as necessary for stability and protection of adjacent properties from the influence of groundwater. The design of such facilities shall be contained in the approved preliminary (initial) soil engineering or engineering geology report and shall appear on the approved grading plan pursuant to the approval of the soil engineer and/or the engineering geologist.

Subsurface drainage facilities shall be installed where natural and/or artificially introduced ground water affects or is likely to affect the project in a potentially unstable, hazardous or otherwise deleterious manner.

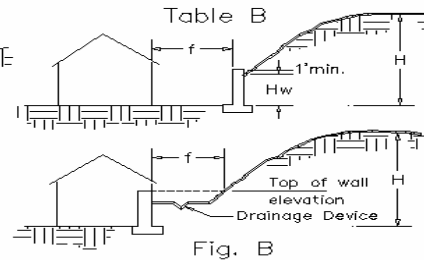
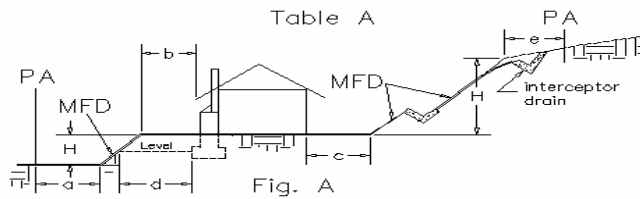
### 11.3 Disposal

All drainage facilities shall be designed under the supervision of a registered civil engineer to carry waters to the nearest practicable drainage way approved by the City Engineer and/or other appropriate jurisdiction as a safe place to deposit such water. Erosion of ground in the area of discharge shall be prevented by installation of non-erosive downdrains, rip rap, energy dissipators or other approved devices including a return of flow to a natural sheet flow condition.

# Detail 1

Min. Setback From Adjacent Slope					
H(hgt) Feet	a	b	c	d	e
0-6	3'	7'	3'	5'	1'
6-14	5'	7'	H/2	H/2 5' min.	H/5
14-30	5'	H/2 10' max.	H/2	H/2 10' max.	H/5
+30	5'	10'	15'	10'	6'

H(hgt) Feet	Max. Hw	Min. Setback f
0-6	3'	3' min.
6-12	H/2	H/2
12-30	6'	H/2
+30	6'	15'



## NOTES:

1. PA means permit area boundary and/or property line; MFD means manufactured surface.
2. Setbacks shall also comply with applicable zoning regulations.
3. Table A applies to manufactured slopes and 2:1 or steeper natural slopes. Setbacks from natural slopes flatter than 2:1 shall meet the approval of the City Engineer.
4. "b" may be reduced to 5' minimum if an approved drainage device is used; roof gutters and downspouts may be required.
5. "b" may be reduced to less than 5' if no drainage is carried on this side and if roof gutters are included.
6. If the slope between "a" and "b" levels is replaced by a retaining wall, "a" may be reduced to zero and "b" remains as shown in Table A. The height of the retaining wall shall be controlled by zoning regulations.
7. "b" is measured from the face of the structure to the top of the slope.
8. "d" is measured from the lower outside edge of the footing along a horizontal line to the face of the slope. Under special circumstances "d" may be reduced as recommended in the approved soil report and approved by the City Engineer.
9. The use of retaining walls to reduce setbacks (Fig.B) must be approved by the City Engineer.
10. "f" may be reduced if the slope is composed of sound rock that is not likely to produce detritus and is recommended by the soil engineer or engineering geologist and approved by the City Engineer.
11. "a" and "e" shall be 2' when PA coincides with Arterial or local street right of way and when improved sidewalk is adjacent to right of way.
12. "e" shall be increased as necessary for interceptor drains.



Where surface waters are to be conducted or directed onto adjacent property in an unnatural manner, the City Engineer may require the applicant, prior to issuance of a grading permit, to obtain written permission from the owner of said property, accepting the surface waters.

Building sites shall have a sheet flow drainage gradient of two (2) percent from the structure toward approved swales and/or drainage facilities, unless otherwise waived by the City Engineer. The maximum drainage gradient of an earth swale shall be 4 percent.

Grading of future building sites under a preliminary grading permit for the purpose of lot sales shall have a sheet flow drainage gradient of two (2) percent toward approved drainage facilities. The City Engineer may reduce this minimum gradient to one (1) percent upon the written request of the applicant or his agent, providing the applicant demonstrates the following:

- a. Finish grades for drainage of building sites can be constructed in accordance with the requirements of this subsection without importing additional fill, and
- b. Sufficient approved swales and/or drainage facilities are constructed to prevent water from ponding on any lot supported by a natural slope or cut or fill slope over five (5) feet in height.

Finish grades, other than above, shall conform to the following minimum drainage gradient standards:

	Minimum Gradient
a. Earth swale	1.0%
b. Earth (sheet flow)	1.0%
c. Asphalt pavement (sheet flow)	1.0%
d. Concrete drain in earth area	0.5%
e. Concrete gutter in asphalt paved area	0.5%

#### 11.4 Interceptor Drains

Paved interceptor drains shall be installed along the top of all manufactured slopes where the tributary drainage area flows toward the slope and has a drainage path to top of slope greater than forty (40) feet measured horizontally. Interceptor drains shall be paved with a minimum of three (3) inches of reinforced concrete. They shall be designed to contain the 100 year flow and have a minimum depth of eighteen (18) inches and a minimum paved width of thirty six (36) inches measured horizontally across the drain. The slope of the drain shall be approved by the City Engineer.

## 11.5 Pipe Specifications

Pipe material specifications shall be shown on the approved plans or in the approved soil report by the civil engineer or soil engineer and approved by the City Engineer. The pipe shall conform to the currently adopted Standard Specification for Public Works Construction unless otherwise recommended by the civil engineer or soil engineer and approved by the City Engineer.

Approved on-site pipe not maintained by the City includes:

- a. Polyvinyl Chloride Plastic Pipe (PVC)
  1. Sub drain
    - (a) ASTM D3034, SDR 35
    - (b) ASTM D1785, schedule 40
  2. Storm Drain
    - (a) ASTM D3034, SDR 35  
Maximum velocity, 8 feet per second
    - (b) ASTM D1785, schedule 40  
Maximum velocity, 15 feet per second
- b. Reinforced Concrete Pipe (RCP)  
D-load to be designed and shown on approved grading plans.
- c. Corrugated Steel Pipe (CSP)  
Metal thickness to be designed and shown on approved grading plans.
- d. Corrugated Aluminum Pipe (CAP)  
Metal thickness to be designated and shown on approved grading plans.
- e. Non-reinforced Concrete Pipe  
Pipe shall be extra strength.

The maximum flow design parameters may be exceeded in special circumstances when justified and recommended by the civil engineer and approved by the City Engineer.

## 11.6 Area Drain Grates

The minimum cross-section area of area drain grates shall not be less than 100 square inches, and shall contain a grate cover having 50% net opening.

## 11.7 Conduits Beneath Structures

Drainage conduits placed beneath structures shall conform to the requirements for sewer and waste plumbing. PVC and ABS pipes shall be schedule 40.

## SUBARTICLE 12. ASPHALT CONCRETE PAVEMENT FOR PRIVATE IMPROVEMENTS

### 12.1 Asphalt Concrete and Base Standards

Prime coat shall be placed on subgrade or base when the base will be subjected to substantial construction traffic or long periods of time before asphalt concrete is placed, as determined by the soil engineer and approved by the City Engineer.

Base may require testing by an approved testing agency to insure its compliance with the applicable specifications and special provisions when determined necessary by the City Engineer. Tests may include but shall not be limited to:

- a. Sieve analysis
- b. Sand equivalent
- c. Percent of crushed particles retained by a No. 4 screen.
- d. R Value Test

### 12.2 Soil Sterilization

Weed killer shall be required on subgrade if no aggregate base is used.

### 12.3 Surface Drainage

All concentrated drainage in asphalt paved areas shall be carried by approved concrete drainage devices.

### 12.4 Pavement Structural Section

The project soil engineer or design civil engineer shall determine the pavement structural section(s) for parking lots/service roads and private streets based on: (1) soil tests of the subgrade soil(s) performed by an approved soil testing laboratory; and (2) anticipated traffic and/or loading conditions. Construction materials, methods of compaction and testing requirements shall be in accordance with the latest addition of the Standard Specifications for Public Works Construction. The relative compaction of each layer of compacted base material shall not be less than 95 percent of ASTM D1557.

When private street improvement plans are required to be approved by the City Engineer, the pavement structural section shall be approved by the City Engineer.

In lieu of a recommended structural section from the soil engineer or civil engineer for parking lots/service roads, the following standards may be used:

	Pavement Structural Section
a. Parking stall areas	3"AC/6" Base
b. Commercial driveways, perimeter drives and loading areas	3"AC/10" Base
c. Industrial driveways, perimeter drives and loading areas	3"AC/12" Base

## 12.5 Driveways

Whenever access is taken from a street, alley or driveway to an off-street parking area serving four (4) or less dwelling units, the driveway or other vehicular access way shall have a maximum grade of plus fifteen percent (+15%) or minus six percent (-6%), measured from the street, alley or driveway grade along the driveway center line, for a distance of not less than eighteen (18) feet from the street, alley or driveway right-of-way line or minimum distance and grade as established by the Murrieta Fire District.

Whenever access is taken from a street, alley or driveway to an off-street parking area serving industrial, commercial or professional uses, public or community facilities, or five (5) or more dwelling units, the driveway or other vehicular access way shall have a maximum grade of a plus fifteen percent (+15%) or a minus two percent (-2%), measured from the street, alley or driveway grade along the driveway center line for a distance of not more than eighteen (18) feet from the street, alley or driveway right-of-way line or minimum distance and grade as established by the Murrieta Fire District.

## SUBARTICLE 13. EROSION CONTROL

### 13.1 Erosion/Sedimentation Control Plans

- a. The erosion/sedimentation plan shall minimize the deposition of sediment from graded lots and streets to adjacent properties.
  1. Temporary sediment control measures may consist of the placement of straw or hay bales, gravel bags, desilting basins with energy dissipators, vehicle access ramps, filter fabric fences and temporary drainage inlets.
  2. The placement and design of sediment control measures shall be based on hydrologic and sediment yield studies of the site.
- b. The plan shall include but not be limited to:
  1. The name and twenty-four (24) hour telephone number of the person responsible for performing emergency erosion control work.

2. The signature of the professional engineer who prepared the erosion/sedimentation control plan.
  3. All desilting and erosion protection facilities necessary to protect adjacent property from sediment deposition.
  4. The placement of the sediment control measures including spacing, alignment and typical detail and slope planting or other measures to control erosion from all slopes above and adjacent to roads open to the public. See 13.2 for Erosion Control - Landscaping requirements.
  5. The plan shall indicate how access will be provided to maintain desilting facilities during wet weather.
  6. Plans shall include the applicable standards from the Murrieta Standard Plans Manual.
  7. The faces of cut and fill slopes shall be prepared and maintained to control erosion and to provide stability. Where cut slopes are not subject to erosion due to erosion-resistant character of materials, such protection may be omitted.
- c. All State and Federal erosion control requirements shall be met.

### 13.2 Erosion Control - Landscaping

Unless otherwise recommended in the approved soil engineering or engineering geology report, cut and fill slopes shall be planted in accordance with this section. The protection for the slopes shall be installed as soon as practicable and prior to calling for final permit approval.

- a. **General Requirements.** All slopes requiring erosion control landscaping shall be planted with drought-tolerant grass or ground cover in order to protect the slopes from erosion and instability. Slopes exceeding 15 feet in vertical height shall be planted with drought-tolerant shrubs, spaced at not more than 10 feet on center; or trees, spaced not to exceed 20 feet on center, or a combination of such shrubs and trees at equivalent spacing, in addition to a drought-tolerant grass or ground cover. Fifty percent of the total number of trees provided shall be of a drought-tolerant nature and a minimum 5 gallon size. The plants selected and planting methods used shall be suitable for the soil and climatic conditions found on the site. The landscape design shall consider and locate plants in zones, according to their water needs. Plant materials and planting patterns may be varied upon the recommendation of a landscape architect with approval of the City.

If a species other than those from the recommended plants indicated on Riverside County Building and Safety Form 284-41, reprinted at Appendix E, is selected, a written statement shall be submitted by a landscape architect certifying that the plant is drought-tolerant and suitable for erosion control and slope stabilization purposes. This statement must accompany the erosion control-landscaping plan at the time of

submittal. Plant material shall be allowed that is specifically identified as being drought-tolerant and suitable for erosion control and slope stabilization on an erosion control landscape plan.

b. Erosion Control-Landscape and Irrigation Plan Requirements.

(1) Erosion Control-Landscape Plan Requirements. Landscape plans shall be submitted for all slopes exceeding fifteen (15) feet high, required to be planted. A landscape plan shall include:

- (a) A slope planting schedule that provides common and scientific names and specifications of all plants, including the names of all species, number and size of each tree and shrub and the spacing of plants.
- (b) The location of the planting.
- (c) Details necessary to complete the project including scope of work, materials to be used (seed mixtures, plant species listed by size, quantity, fertilizer used and rate of application), construction methods, maintenance and time table for project completion.

(2) Irrigation Plan Requirements. Except where approved by the City, slopes required to be planted shall be provided with an approved system of irrigation designed to cover all portions of the slope and shall be of sufficient clarity to indicate the extent of work proposed. Slopes that are 3:1 or steeper shall have irrigation lines placed on the ground surface and slopes that are less than 3:1 shall have irrigation lines placed below ground surface with trenches compacted by mechanical means and in accordance with Subsection 9.4, Compaction. The irrigation system shall have zones which take into account the water requirements of the different types of plant species located in the zone and shall be adjusted to vary the water within the zone in accordance with the needs of the plant material. Care shall be taken to minimize runoff. Turf areas shall be irrigated separately from slope areas. The irrigation system provided shall make use of automatic timers, moisture sensors and low precipitation heads or emitters. The use of a drip type irrigation system is highly recommended wherever possible. Seasonal irrigation requirements of the plant species proposed shall be determined and recommendations provided as to the duration and frequency of irrigation. Specifications for proposed devices, size and type of pipe, flow and precipitation rates are to be included on the erosion control-landscape plan.

An approved backflow prevention device shall be installed in each irrigation system which conforms to Chapter 10 of the Uniform Plumbing Code. Projects with access to or of sufficient size to economically justify the use of reclaimed water through use of a dual distribution system are encouraged to do so. Prior to City approval, reclaimed water irrigation systems are subject to the approval of the State Water Quality Control Board.

If the planting requirements specified in Section d are waived by the City, the requirements specified in this subsection may be waived.

- c. **Planting Method.** Planting shall commence as soon as slopes are completed on any portion of the site and shall provide for rapid short term coverage of the slope as well as long term permanent coverage. Minimum requirements shall include:
  1. **Planting Holes.** Planting holes shall be excavated twice as wide as the diameter and 2 inches less than the depth of the root ball of the plant. The planting holes shall be backfilled with a mixture of native soil, slowly decomposing organic matter and an appropriate fertilizer. The construction of a watering basin at the base of all trees and shrubs at a distance encompassing the drip line is recommended in order to encourage deep percolation of irrigation. The application of mulch to the surface area of the watering basin will help minimize the amount of irrigation lost to evaporation. A commercially prepared mulch, wood chips, grass clippings or a combination of vegetal matter may be used in this regard.
  2. **Staking.** Each tree shall be staked in order to anchor the root system and to support the trunk in an upright position. Stake material shall be of adequate dimension and length to support the tree. Ties used for tying the tree to the stake shall have a broad surface to minimize rubbing or girdling and have some elasticity. In lieu of stakes, a three wire tie-down system may be used.
  3. **Ground Cover Spacing.** Ground covers are to be spaced in such a manner that 100% coverage of the planted slope will be achieved in as short a time as possible.
  4. The finish grading and drainage provided on the adjacent all planted slopes, shall promote healthy plant growth and minimize erosion and runoff.
- d. **Waiver of Planting Requirements.** Waiver of planting and irrigation requirements may be approved by the City if found to be unreasonable or unnecessary for one of the following reasons:
  1. The erosion resistant character of material composing the slopes as recommended in the approved soil engineering report make planting unnecessary.
  2. The unavailability of water making irrigation either impossible or impractical.
  3. Slope heights are less than those requiring planting.
- e. **Planting Maintenance.** All vegetation planted for erosion control shall be maintained in a healthy, vigorous condition. Maintenance of planted slopes shall include watering, weeding and restoration of any plant material that may die. Slopes that are affected by the future installation of walls, fences, swimming pools or any other building must be properly replanted upon the completion of subsequent projects.

- f. Bonding. A performance bond as dictated in the code shall be required for erosion control remedies at the time the erosion control-landscaping plan is approved. The bond shall be released upon approval of the final planting inspection but may be earlier released, in the discretion of the City Engineer.
- g. Final Planting Inspection. A final planting inspection shall be required for all sites requiring erosion control planting. Any required irrigation system and all planting shall be installed at the time of the final planting inspection. For sites requiring a performance bond, slope certification required by the next subsection shall be approved prior to the building permit final inspection. The final planting inspection shall be performed at the end of the one year bond period. A site inspection shall be performed by the responsible landscape architect to assure compliance with the approved plans and to perform a functional test of the sprinkler system to include the backflow prevention device. Said landscape architect shall certify in writing to the City Engineer that the soils additives, amendments, weed control, planting of the slopes and the installation of the irrigation system comply to the approved plans and to all the provisions of this section. Certification to contain a statement as to grow stock vitality.
- h. Landscape and Irrigation Plan/Plan-Checking and Inspection Fee. Before accepting a set of plans and specifications for checking, the City shall collect a plan checking fee, the amount as specified by the Fee Schedule Ordinance. The inspection fee shall be paid prior to final inspection and release of the landscape bond, the amount as specified in the Fee Schedule Ordinance.

## SUBARTICLE 14. ON SITE GRADING INSPECTION

### 14.1 Site Inspection by the City Engineer

The City Engineer may inspect the project at the various stages of work to determine that adequate control is being exercised by the professional consultants.

Prior to any grading, brushing or clearing, there shall be a pregrading meeting held on the site. Prior to pouring curb and gutter or placement of pavement base material, there shall be a prepaving meeting held on the site. The permittee, or his agent, shall notify the City Engineer at least two (2) working days prior to the meeting and shall be responsible for notifying all principals responsible for grading or paving related operations.

It shall be the duty of the person doing the work authorized by a permit to notify the City Engineer at least one (1) working day prior to the work being ready for the following inspections.

- a. Excavation and Fill Inspection
  - 1. Canyon Cleanout: After all brush and unsuitable material has been removed and an acceptable base has been exposed, but before any fill is placed.



2. Toe bench and key: After the natural ground or bedrock is exposed and prepared to receive fill, but before fill is placed.
  3. Over-Excavation: After the area has been excavated but before fill is placed.
  4. Excavation: After the excavation is started, but before the vertical depth of the excavation exceeds ten (10) feet, and every ten (10) feet interval thereafter. Continuation of this excavation operation need not await the arrival of the grading inspector provided that proper notification has been made to the City Engineer.
  5. Fill: After the fill has started, but before the vertical height of the fill exceeds ten (10) feet, and every ten (10) feet interval thereafter. Continuation of this fill operation need not await the arrival of the grading inspector provided that proper notification has been made to the City Engineer.
- b. Concrete drainage device inspection:
1. Alley gutter and/or concrete device that drains asphalt paving:
    - (a) Subgrade (prior to placement of concrete): Subgrade is to be prepared and required reinforcement placed. The civil engineer shall provide a field memo that line and grade is set in accordance with the approved plans.
    - (b) Concrete placement. Concrete placement need not await the arrival of the grading inspector provided proper notification has been made to the City Engineer.
  2. Curb and gutter:
    - (a) Subgrade (prior to placement of concrete): Subgrade is to be made, forms and reinforcement are to be placed. The civil engineer shall provide a field memo that line and grade is set in accordance with the approved plans.
    - (b) Concrete placement. Concrete placement need not await the arrival of the grading inspector provided proper notification has been made to the City Engineer.
  3. Terrace drains, down drains, brow ditches, and all other paved drainage devices:
    - (a) Subgrade: Prior to placement of welded wire mesh or reinforcing steel. The civil engineer shall provide a field memo that line and grade is set in accordance with the approved plans.
    - (b) Reinforcement: Thickness control wire and reinforcing steel or welded wire mesh are to be installed but prior to placement of concrete.

- (c) Concrete placement. Concrete placement need not await the arrival of the grading inspector provided proper notification has been made to the City Engineer.

4. Sidewalks used as drainage devices.

Subgrade: Prior to placement of concrete, subgrade is to be made, forms are to be in place with the required reinforcement. The civil engineer shall provide a field memo that line and grade is set in accordance with the approved plans.

c. Drainage device other than concrete inspection:

1. Sub Drains:

- (a) After excavation but prior to placement of filter material and pipe. The sub drain pipe and filter material shall be on-site for inspection.
- (b) After filter material and sub drain has been placed but prior to covering with backfill.

2. Storm drains and inlets:

- (a) After placement of storm drains but prior to covering with backfill. The civil engineer shall provide a field memo that line and grade is set in accordance with the approved plans.
- (b) After placement of inlet forms but prior to pouring concrete. The civil engineer shall provide a field memo that line and grade is set in accordance with the approved plans.

3. Earth Swales:

- (a) Prior to rough grading approval or lumber drop.
- (b) Prior to final grading approval.

d. Rough Grade Inspection

When all rough grading has been completed. This inspection may be called for at the completion of rough grading without the necessity of the City Engineer having previously reviewed and approved the required reports if the grading was performed under a precise grading plan. Under normal circumstances, all sub drains and slope drains shall be in place and approved as a condition for rough grading approval.

e. Paving Inspection

1. Subgrade;

After subgrade has been established, testing and approved by the soil engineer, or his qualified representative. The soil engineer shall provide a field memo of

compaction test results. The civil engineer shall provide a field memo that line and grade is set in accordance with approved plans.

2. Base:

After base course has been placed, tested and approved by the soil engineer, or his qualified representative, but prior to prime coat and asphalt placement. The soil engineer shall provide a field memo of compaction test results. The civil engineer shall provide a field memo that line and grade is set in accordance with the approved plans. Material invoices may be required.

3. Asphalt

(a) During asphalt lay down. Material invoices may be required. Asphalt placement need not await the arrival of the grading inspector provided that proper notification has been made to the City Engineer.

(b) Prior to application of seal coat, the paved surface shall be water tested to reveal any irregularities and shall be patched where required. Material invoices may be required after placement of seal coat.

f. Final Inspection

After all work, including installation of all drainage structures and other protective devices, has been completed and all written professional approvals and the required reports have been submitted. An As-Built plan will be required if, in the opinion of the City Engineer, the finished site significantly deviates from the approved grading plan.

g. Siltation Control Facilities

1. After excavation of desilting basins but prior to fill placement. Erosion control devices are to be available on-site for inspection.

2. After fill placement for desilting basins but prior to placement of concrete or other non-erosive materials.

3. After completion of an erosion control system in accordance with an approved erosion control plan and the requirements of the City Engineer.

## 14.2 Alternate Materials and Methods of Construction

a. The provisions of this grading manual are not intended to prevent the use of any material or method of construction not specifically prescribed by the grading code or this grading manual provided any such alternate has been approved pursuant to this section.

b. The City Engineer may approve any such alternate provided he finds that the proposed design is satisfactory and complies with the provisions of the grading code and this grading manual and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in quality, strength, effectiveness and safety .

- c. The City Engineer shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding its use.
- d. Whenever there is insufficient evidence of compliance with the provisions of this grading manual or evidence that any material or any construction does not conform to the requirements of this grading manual or in order to substantiate claims for alternate material or methods of construction, the City Engineer may require tests as proof of compliance to be made at the expense of the owner or his agent by an approved testing agency.
- e. Test methods shall be as specified by this grading manual for the material in question. If there are no appropriate test methods specified, the City Engineer shall approve the test procedure. Copies of the results of all such tests shall be retained for a period of not less than two (2) years after the acceptance of the grading.

## SUBARTICLE 15. COMPLETION OF WORK

### 15.1 Final Reports

Upon completion of the rough grading work and at the final completion of the work under the grading permit but prior to the issuance of building permits or release of grading bonds or issuance of a certificate of use and occupancy, the City Engineer will require:

- a. An as-graded grading plan prepared by the professional engineer or architect, which shall include corrected original ground surface elevations if necessary, graded ground surface elevations, lot drainage patterns, manufactured slope inclination, and location of all drainage facilities and sub drains including the tie in with adjacent properties.
- b. A written approval by the engineer of work approving the grading as being substantially in conformance with the approved grading plan and which specifically approves the following items as appropriate to the project and stage of grading:
  - 1. Construction of line and grade for all engineered drainage devices and retaining walls (rough and final grading).
  - 2. Staking of property corners for proper building location (rough grading).
  - 3. Setting of all monuments in accordance with the recorded tract map (rough or final grading).
  - 4. Location of permanent walls or structures on property corners or property lines where monumentation is not required (final grading).
  - 5. Location and inclination of all manufactured slopes (rough and final grading).
  - 6. Construction of earthen berms and positive building pad drainage (rough and final grading).

- c. A soil engineer report prepared by the soil engineer, including type of field testing performed, suitability of utility trench and retaining wall backfill, summaries of field and laboratory tests and other substantiating data, locations of sub drains, keyways and buttresses, and comments on any changes made during grading and their effect on the recommendations made in the soil engineering investigation report. Each field density test shall be identified, located on a plan or map, the elevation of test and finish grade elevation shown, and the method of obtaining the in place density described, (Uniform Building Code Standard 70-2). The soil engineer shall provide a written approval as to the adequacy of the site for the intended use, as affected by soil engineering factors.
  
- d. A geology report prepared by the engineering geologist, including a final description of the geology of the site including any new information disclosed during the grading (such as unstable slopes that have been stabilized, suitability of cut slopes, faults and their age and/or the need and distance for setbacks), and the effect of same on recommendations incorporated in the approved grading plan. He shall provide a written approval as to the adequacy of the site for the intended use as affected by geologic factors and shall submit an as-built geologic map.

APPENDIX A  
GRADING PLAN STANDARDS  
AND  
CORRECTION LIST

CITY OF MURRIETA  
GRADING PLAN STANDARDS AND CORRECTION LIST

CIRCLED ITEMS REQUIRED CORRECTION OR SUBMITTAL.

Corrections shall be made on the tracings and 2 new sets of plans shall be submitted. IF YOU MAKE CHANGES TO THE PLAN OTHER THAN OR IN ADDITION TO WHAT PLAN CHECK HAS REQUESTED, YELLOW HIGHLIGHT THE CHANGES ON ONE SET OF THE RESUBMITTED PLANS.

RETURN THIS SHEET WITH CORRECTED PLANS AND THE ORIGINAL CHECK PRINT.

Payment of a new plan check fee shall be required for all plans on which no action is taken by the applicant for a period of 180 days. Applications for which no permit is issued within 180 days following date of submittal shall expire by limitation, and shall be discarded.

I. APPLICATION

- a. Sign and complete application.
- b. Sign and complete Notice of Application Completion.
- c. Provide 3 complete sets of corrected plans. The maximum size shall be 24" x 36". All sheets shall be uniform size.
- d. Plan Check Fees:
  - Grading.....
  - Improvements...
  - Paid.....
  - Balance.....
- e. Permit Fees:
  - Grading.....
  - Improvements...
  - Issuance Fee...
  - Balance.....
- f. Bond required in the amount of \$\_\_\_\_\_. If Surety Bond used, recommend use of City Bond Form which is available upon request.

II. CLEARANCES ARE REQUIRED FROM

- a. Planning
- b. CSD 143 (For trails, open space and recreation areas, and local park grading review. Submit 1 plan.)

- c. California State and Regional Water Quality Control Board.
- d. California Department of Fish & Game.
- e. Riverside County Flood Control District.
- f. Fire Department (For fuel modification clearance).
- g. Environmental Health (For vector control clearance).
- h.
- i.
- j.

III. GENERAL REQUIREMENTS

- a. Show assigned project address on title sheet of plan.
- b. Show yardage figures on plans.
  - cut \_\_\_yds
  - overexcavation \_\_\_yds
  - natural fill \_\_\_yds
  - import \_\_\_yds
  - export \_\_\_yds.
- b. Plans to be signed by a licensed civil engineer or Architect.

- d. Show on plans:
  - North Arrow
  - Grading limit
  - Scale
  - Permit Limits
  - Grading Legend
  - Property Line
  - Vicinity Map
  - Tract Number
  - Bldg. Numbers
  - Lot Numbers
- e. Show location of all existing and proposed structures, buried tanks and wells.
- f. Submit an itemized summary of the cost of all drainage devices, grading, paving, and erosion control.
- g. A notarized letter of permission from adjacent property owners required for slope encroachment or other off-site grading or work. Include legal description and Assessor's Parcel Number.
- h. Retaining walls are not a part of the grading permit. Submit for separate building permit. Note on plans. Show location of walls on grading plan plus top of wall, adjacent finished surface elevation and a cross section detail.
- i. Show all cut/fill transitions and daylight lines.
- j. Show existing and proposed elevations using contours and/or spot elevations.
- k. Indicate disposition of excess earth materials. A separate permit may be required.
- l. Add the following to the plan tracings:
  1. Grading notes. See attached sheet.
  2. Paving notes. See attached sheets.
  3. Detail sheets \_\_\_\_\_.
  4. Erosion control notes. See attached sheet.

5.

- m. Show street width and centerline. Include cross-section detail.
  - n. Show all easements.
  - o. Extend existing contours or spot elevations to reflect off-site areas and identify drainage pattern.
  - p. Incorporate Conditions of Approval into plans, and grading notes.
  - q. Approved erosion control measures are to be installed and functional during the rainy season from October 15 to April 15. Justify design with hydrology and hydraulic calculations. Submit 4 copies of an erosion control plan and a cost summary of erosion control facilities.
  - r. Show detail on plan how finished grades meet adjoining property.
  - s. Show on plans name, address, and telephone number of:
    - Owner
    - Soil Engineer
    - Architect
    - Archaeologist
    - Paleontologist
    - Engineer of Work
    - Grading Contractor
    - Engineering Geologist
  - t. Call out bench mark and bearing reference point.
  - u. The percent grade of the driveway shall be shown on the plan.
  - v. Leach field/seepage pits must be plotted on the grading plan.
  - w. There may be additional comments after pre-inspection has been conducted. The pre-inspection is a field verification that the plan and soils report accurately reflects existing conditions.
  - x. Provide one copy of the rough grading plan as reference for the precise grading plan.
- IV. DRAINAGE
- a. A notarized letter of acceptance



- required from adjacent property owner(s) for acceptance of unnatural drainage. Include legal description and Assessor's Parcel number. Applicant must have this document recorded.
- b. Submit a hydrology study and/or hydraulic calculations for
  - c. Show limits of Flood Plain and finish floor elevations.
  - d. Show existing off-site terrace and drainage features that could significantly affect the project.
  - e. A berm, 12" high by 4' wide is required at tops of all slopes. Illustrate with typical detail.
  - f. Provide 1 copy of CC&R's outlining drainage rights and maintenance responsibilities.
  - g. Show location and provide details for all sub drain systems as recommended in the soil/geology report, by \_\_\_\_\_ dated \_\_\_\_\_
  - h. Maximum gradient for sheet flow 10%.
  - i. Minimum acceptable gradients:
 

1. Earth	1.0%
2. Asphaltic concrete	1.0%
3. Concrete in earth	0.5%
4. Concrete in A.C.	0.5%
5. Lot swales	2.0%
6. Terrace drains	5.0%
  - j. Show plan and section details of typical lot drainage. Minimum 2%, maximum 21%, away from a building pad to a swale is required.
  - k. Drainage shall be conducted to a street, natural watercourse, or other approved location.
  - l. Drainage over a manufactured slope is not permitted except in approved devices.
  - m. Show limits of roof gutters and location of down spouts.
  - n. Interceptor drains (brow ditches) top of manufactured slopes are required to intercept surface drainage. Show on plans and

- provide detail.
- o. Cut off walls are required at inlet of paved drains. Show detail on plan.
  - p. Velocity reducers (i.e., energy dissipators) are required where drains discharge onto natural ground. If riprap is to be used, specify class and size. Show on plan and provide detail.
  - q. Concentrated drainage exceeding 4% gradient requires concrete, or other approved non-erosive device.
  - r. Revise plans to show complete details for all drainage structures, i.e., \_\_\_\_\_.
  - s. Provide concrete device in asphalt section to carry concentrated water.
  - t. Show detail and locations of extra depth footings.
  - u. Provide 7' setback from top of slope to building to accommodate graded drainage swale or 5' setback with P.C.C. device to carry drainage, lots
  - .
  - u. Show flow line elevations of all swales and other drainage devices.
  - w. Show retaining wall sub drain details with disposal points, flow line elevations and pipe material.
  - x. Show typical section of driveway and/or pavement section.

## V. SLOPES

- a. Provide setbacks as outlined in the Grading and Excavation Code.
- b. Show detail of typical slope benching preparatory to fill placement.
- c. Provide a minimum 6' wide terrace at maximum 30 foot intervals measured vertically.
- d. Provide a minimum 12' wide terrace if slope exceeds 60 feet in height. (mid-height)
- e. A downrain shall be installed for every single run of terrace drain that collects runoff from a slope watershed area of 13,500 sq. ft.

- f. Show on plans the proposed location and fully dimensioned cross sectional details of all buttress fills recommended by the project soil engineer and/or engineering geologist.
- g. Show top and toe of cut and fill slopes.

VI. GEOTECHNICAL

- a. Submit for review and approval (1)
  - Preliminary soil engineering
  - Preliminary engineering geology
  - Percolation Report
- b. Submit for approval two copies of precise grading plan and site revised report from your soil engineer.
- c. Soils and geology reports must be approved by the City.
   
\_\_\_\_\_
   
\_\_\_\_\_
   
\_\_\_\_\_
- d. Delineate areas of overexcavation and recompaction as recommended by the soil engineer. Detail and show volume as separate item. Where depth exceeds 12", soil engineer to verify recommended compaction in his final report.
- e. Delineate on the plans and provide details for rock disposal areas as recommended by the project soil engineer.
- f. Your soil report recommends 2 or more options of site development. Show on plan what option is to be used.

VII. ADDITIONAL

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

APPENDIX B

TECHNICAL GUIDELINES FOR SOIL AND GEOLOGY REPORTS

CITY OF MURRIETA  
GRADING SECTION

Technical Guidelines for Soil and Geology Reports

PREFACE:

The ultimate responsibility for a safe design, construction and maintenance of any grading project rests with the consulting engineers, geologists, contractors, and the owner. Since site conditions and the proposed development plan varies so greatly between projects, the Engineering Department recognizes the discretion and judgments that must be used by the consulting professionals. It is, therefore, essential to enhance the general understanding between the permit applicants, consultants and the Engineering Department.

The purpose of these technical guidelines is to inform grading permit applicants and their professional consultants of the basic information looked for by the City Engineering Department in reviewing preliminary (initial) Soil and Geology reports for grading permit applications and rough grade compaction reports. The guidelines used for the preparation of this document are:

The City of Murrieta Grading and Excavation Code, the Uniform Building Code, the California State Board of Registration policy statement (effective 1/1/79) on adequacy of professional geological work as represented by the guidelines for standards of practice issued by the California Division of Mines & Geology, the Planning Commission and conditions of approval, and presently accepted geotechnical engineering and engineering geologic practices.

DESCRIPTION:

The technical guidelines are divided into 6 parts to distinguish report content for different project types and topographic areas to be developed by grading. The more involved grading projects will encompass, but not be limited to, several parts listed below:

- Part I Single Family Dwellings (flatland) - identifies the report content for grading reports on single family dwellings in the flatland areas.
- Part II Single Family Dwellings (hillside) - identifies the report content for grading reports on single family dwellings in hillside areas (additive to the requirements of Part I).
- Part III Single Family Dwellings (supplemental information) - identifies additional report content which may be needed with Part I and Part II depending on the site conditions and development proposed (additive to the requirements of Parts I and II).
- Part IV Commercial and Industrial Sites - identifies the report content for precise grading plans on commercial and industrial sites including apartment complexes (additive to the requirements of Part I and applicable items of Part III).

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Part V Residential, Commercial and Industrial Subdivisions (tracts and parcels) - identifies the report content for preliminary grading reports of large commercial and industrial subdivisions and preliminary and precise grading reports of residential subdivisions in flatland and hillside areas (additive to the requirements of Part I and applicable items of Parts II and III).

Part VI Rough Grade Compaction Reports - identifies the report content for preliminary and precise grading permit rough grade compaction reports.

Due to a particular site conditions, proposed improvements or the policies of testing firms or project consultants, some of these items may be included in subsequent reports on the same project with the conditional approval of the City.

### GRADING PLAN REVIEW REPORT:

A grading plan review report is an evaluation of the conclusions and recommendations in the preliminary soil and geology reports as they relate to the proposed grading plan. It is usually required when there are changes in the proposed developments, consulting firms, soil engineer or engineering geologist, an update of the preliminary report or signatures are needed, or the project is a conversion to precise grading plan application. The grading plan review reports are supplements to the preliminary reports and are an opportunity for the consultants to review the planned development. The purpose is to determine if the preliminary reports are adequate and complete for the presently planned grading and construction on the site and if the conclusions and recommendations still apply to the proposed operations. It is not intended that the soil engineer or engineering geologist approve or disapprove the grading plan, but provides them an opportunity to update the preliminary reports and include additions or qualifications as necessary. The date and name of the person preparing the latest grading plan reviewed should be identified for reference purposes.

### PART I: TECHNICAL GUIDELINES FOR PRELIMINARY REPORTS (SOIL REPORTS) ON SINGLE FAMILY DWELLINGS IN FLATLAND AREAS

#### A. General

1. Signature and RCE number of project soil engineer.
2. Job address.
3. Location description and/or location index map with reference north, scale, etc.
4. Description of site conditions (topography, relief, vegetation, man-made features, drainage and watershed).
5. Proposed grading (general scope, amount, special equipment and/or methods if applicable).

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6. Planned construction (type of structure and use, type of construction and foundation/floor system, number of stories, estimated structural loads).

### B. Field Investigations

1. Scope (date work done, investigative methods, sampling methods, logs of borings/test pits, elevations of borings/test pits for reference of materials and samples to finished grade or footing elevations, identify real or assumed elevations).
2. Plan with legend showing: site limits, terrain features, man-made features, boring/test pit locations, proposed improvements (including slopes with ratios, soil limits, daylight lines, paving areas, retaining walls, sub drains, overexcavation/cleanout/uncertified fill areas).
3. Location of all samples taken, surface and subsurface, plotted on appropriate scale maps.
4. Groundwater conditions and potential (future natural and artificial seepage effects).

### C. Engineering/Material Characteristics and Testing

1. Test methods used, type or condition of samples, applicable engineering graphics and calculations, results of all tests, and sample locations of all test samples.
2. Unified Soil Classification of materials.
3. Material competency and strength.<sup>1</sup>
  - a. Field densities (and relative compactions where pertinent) and moisture content.
  - b. Shear strength of foundation material (drained or undrained conditions, effective stress or total stress analysis, in-situ or remolded samples must be identified).
  - c. Consolidation or settlement potential.
  - d. Expansion potential.
4. Maximum density-optimum moisture parameters of proposed fill material if available by Uniform Building Code Standard No. 70-1 or approved equivalent.
5. Shrinkage and/or bulking factors.

### D. Foundation Design Criteria

1. Footing depth and width.<sup>1</sup>
2. Criteria for foundation material preparation.<sup>1</sup>

## Technical Guidelines for Soil and Geology Reports

3. Allowable bearing values based on testing.<sup>1</sup>
4. Lateral pressures (active, passive, or at rest conditions) and coefficient of friction.<sup>1</sup>
5. Settlement - total, differential and rate of settlement calculated based on both existing and likely future site conditions.

### E. Reference

1. In supplementation or grading plan review reports referencing earlier reports, supply copies of those referenced reports or applicable portions as required by the City Engineer.

### F. Conclusions and Recommendations

1. Ground preparation (clearing, unsuitable material removal, scarification and moisturization).
2. Fill support:
  - a. Suitability and precompaction of in situ materials (describe test results and other pertinent data to be used to determine suitability).
  - b. Densification and moisturization or dewatering measures (equipment, surcharge, settlement monitoring if applicable).
3. Placement of fill:
  - a. Material approval (on site, improved).
  - b. Methods and standard (Uniform Building Code Standard 70-1 or approved equivalent).
  - c. Testing (min. 90% rel. comp. by U.B.C. standard 70-2 or equivalent) and frequency of field density testing by vertical intervals and/or volume of fill.

<sup>1</sup> U.B.C. requirements may be used as an alternative: soil classification of founding materials by U.B.C. standard #29-1 and use minimums and maximums based on U.B.C. Tables 29-A and 29-B or approved equivalent.

4. Elimination of cut/fill or other differential transition beneath improvements.

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5. Utility trenches:
  - a. Backfill specifications and recommendations under structures, pavements and slopes (min. 90% rel. comp. using native materials) vs. landscape and other areas.
6. Provisions for approval inspections and necessary testing during and on completion of grading.
7. Opinion as to adequacy of site for the proposed development. (This opinion should also be summarized in the first part of the report).
8. Other pertinent geotechnical information for the safe development of the site, such as the location of proposed keyways or buttresses.
9. Placement of drains and tying in with proposed drains.

### PART II: TECHNICAL GUIDELINES FOR PRELIMINARY REPORTS (SOIL AND GEOLOGY REPORTS) SINGLE FAMILY DWELLINGS IN HILLSIDE AREAS

All guidelines listed in Part I for preliminary reports are applicable in addition to the following:

#### A. General

1. Engineering geology report with signature and CEG number of project engineering geologist (generally needed depending on site conditions and proposed developments).
2. Source of base map with date.
3. Geologist performing mapping (if different than signing CEG).
4. Geological setting including general description, index of site on portion of recent large scale geologic map (if available) and references to previous reports (or published papers) and aerial photo data on site area.
5. Topographic features and relationship to site geology (outcrop distribution, slope height and angles and/or ratio, dip slopes, cliffs, faults contacts, erosion pattern, ancient and modern landslides, debris flows, etc.).

#### B. Field Investigations

1. Geologic map showing: site geology, approximate location of proposed keyways or proposed buttresses, if applicable, proposed or existing sub drains, seeps or springs, etc., and be suitable for the general purpose in its size, scale and manifestation and contains an adequate legend. The map should have highlighted representative geologic



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data of sufficient amount and location for evaluation of: general rock or soil unit distribution, geologic structure, downslope movements' features (including soil/rock creep), groundwater conditions, subsidence/settlement features or potential, and other pertinent site characteristics.

2. Substantiation of any known gross differences of opinion with recently available geologic reports or published data or maps on site area.

### C. Earth Materials (Bedrock and Surficial Units)

1. Unit classification, general lithologic type, geologic age, origin.
2. Unit description and characteristics (in sequence for relative age) including:
  - a. Composition, texture, fabric, lithification, moisture, etc.
  - b. Pertinent engineering geologic attributes (clayey, weak, loose; alignments, fissility, planar boundaries; pervious or water bearing parts; susceptibility to mass wasting, erosion, piping or compressibility).
  - c. Distribution, dimensions, or occurrence (supplemental to data furnished on illustrations).
  - d. Suitability as construction and foundation material.
  - e. Effects and extent of weathering (existing and relationship to project design and future site stability, material strength, etc.).

### D. Geologic Structure

1. General Structure
2. Distribution of structural features including position, attitude, pattern and frequency of:
  - a. Fissures, joints, shears, faults and other features of discontinuity.
  - b. Bedding, folds, and other planar features, such as a steep subsurface contacts.
3. Characteristic of structural features including: continuity, width of zones and activity, dominant vs. subordinate, planar nature, plunge, depth, open vs. closed (degree of cementation or infilling), gouge.
4. Structural or cross-sections (one or more appropriately positioned and referenced on map; especially through critical areas, slopes and slides) of suitable size and engineering scale; with labeled units, features and structures; and a legend. These sections should

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correlate with surface and subsurface data showing representative dip components, projections, and stratigraphic/structural relationships.

### E. Stability Features and Conditions

1. Adequate mapping, sections and description showing positions, dimensions and type of existing downslope movement features including soil/rock creep, flows, falls, slumps, slides if any.
2. Activity, cause or contributing factors of downslope movements features.
3. Recent erosion, deposition, or flooding features.
4. Subsidence/settlement, piping, solution or other void features or conditions.
5. Groundwater and surface drainage characteristics or features.
  - a. Surface expression (past and present); permeability/porosity of near surface materials.
  - b. Actual or potential aquifers or conduits, perching situations, barriers, or other controls to percolation and groundwater movement and fluctuation of groundwater levels at the site whether stemming from wholly natural or from likely anthropic sources.

### F. Conclusions and Recommendations (including slope and site stability).

1. Unsuitable material removal (canyon cleanout, overexcavation, etc.).
2. Keyways and benching for existing slopes steeper than 5:1.

## Technical Guidelines for Soil and Geology Reports

3. Specifications for the method of placement and compaction of soil within the zone of the slope face.
4. Slope stability - susceptibility to mass-wasting (creep to rapid failure potential).
  - a. Favorable or unfavorable inter-relationships of fractures (joints, shears, faults, or zones) to planar structures (bedding, contracts, folds, plunges, weathered zones, etc.) and to each other forming potential failure planes, veneers, masses, or blocks.
  - b. Favorable or unfavorable inter-relationships of geologic structures, conditions and potential failure planes to natural and/or man-made topography forming actual or potential adverse dips and contracts adverse fractures (joining, shearing, faulting), adverse fold limbs or synclinal axes, adverse earth masses or blocks.
  - c. Favorable or unfavorable inter-relationships of height of existing or proposed slopes to present and future (weathering effects; rate, depth, etc.) strength of earth materials.
  - d. Slope stability effects onto or from developed, natural, or proposed slopes adjacent properties.
5. Ages of onsite faults, the need for setbacks, and the recommended setback supported by appropriate technical documentation.
6. Potential for liquefaction and other secondary seismic effects.
7. Potential for hydrocollapse and fissuring if the water table changes.
8. Statement of site stability and summary of actual and potential unstable situations relative to the proposed site configuration and necessary stabilization or remedial measures for downslope movements, erosion, groundwater or settlement/subsidence effects. Opinion and recommendations of surficial and gross stability of natural and manufactured slopes.
9. Provisions for necessary inspections of excavations to competent material by the project engineering geologist and/or soil engineer and their approval and/or testing of material competency.
10. Geologic feasibility of the site for the proposed development. (This opinion should also be summarized in the first part of the report).

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### PART III: TECHNICAL GUIDELINES FOR PRELIMINARY REPORTS (SOIL AND GEOLOGY REPORTS) ON SINGLE FAMILY DWELLINGS: SUPPLEMENT TO PARTS I AND II.

This section includes additional report content that may be necessary depending on project site conditions or proposed developments for either flatland or hillside locations.

#### A. General

1. Site conditions - distress on existing improvements in area (expansive, settlement/subsidence, or creep areas).
2. Proposed grading - special grading equipment or methods needed for resistant, saturated or other unusual materials or situations.
3. Proposed rock disposal methods (for clasts and residuals larger than 12 inches) and disposal areas (include on geotechnical plan if disposal area is on site).
4. References to publications and other reports cited.

#### B. Engineering/Material Characteristics and Testing

1. Shear strength evaluations and results (drained or undrained conditions, effective stress or total stress analysis, in-situ or remolded samples).
2. Expansivity analyses of foundation material (test by U.B.C. Standard #29-2 or approved equivalent and classify potential by U.B.C. Table #29-C).
3. Material densities and/or penetration tests (Standard Penetration or other methods of known correlation to material density).
4. Soluble sulfate content of soils in contact with concrete (test by ASTM D516 or equivalent).
5. Gradation/size analyses, if appropriate.
6. Atterberg limit analysis and parameters, if appropriate.
7. Geophysical survey, if appropriate - graphics and results.
8. Include all test methods used, type or condition of sample used, applicable engineering graphics and calculations, results of all tests, and sample locations of all test samples.

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- C. Slope stability analysis (dependent on slope height and ratios, strength of earth materials, internal structure, susceptibility to weathering, actual or potential groundwater, surficial covering, proximity to site improvements or structures, and proposed landscaping and maintenance).
1. Gross stability of natural or man-made slopes with calculations, graphics supporting data and applicable parameters.
  2. Surficial stability of slopes with calculations, graphics, supporting data and applicable parameters.

NOTE: General guidelines for gross stability analyses are provided in "Minimum Standards for Slope Stability Analysis." (Appendix D) formulated by the LA/ASCE Geotechnical Group Committee on Seismic Stability of Soil and Rock adopted by the County of Los Angeles on July 25, 1978, except that they shall apply to all slopes steeper than 2:1.

- D. Seismic evaluation should include regional seismicity; potential for strong shaking, ground rupture, and liquefaction; applicable parameters (peak and/or design ground acceleration, duration of strong shaking, site period) or reference to U.B.C. standards for earthquake design (Chap. 23).
- E. Foundation Design Criteria - Special provision for expansive earth materials.
1. Footing design and placement criteria.
  2. Slab, thickness, reinforcement; separation and expansion joints, construction joints, doweling, or ties.
  3. Bridging; grade beam specifications and recommendations, when applicable.
  4. Prestressed (post-tensioned) flotation slab specifications and recommendations if this system is proposed.
  5. Exterior flatwork recommendations.
  6. Moisture barriers and/or selective grading (aggregate or sand base or other subbase).
  7. Soil moisture measures

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- a. Treatment prior to concrete pouring: "pre-pour moistening," "pre-soaking," or "pre-saturation."
- b. Drainage/irrigation controls to maintain moisture content in foundation materials (including increased positive drainage, paving, cut-off walls, sealed planters, gutters and downspouts, etc.).

### F. Foundation Design Criteria - other special provisions

1. Soluble sulfate content specifications and recommendations based on U.B.C. Section 2604 (c).
2. Footing setback from base of slopes and other setbacks (faults, fracture zones, contacts, etc.).
3. Effects of adjacent loads when footings are at different elevations.
4. Deep foundation systems.
  - a. Allowable bearing values.
  - b. Foundation design criteria, parameters and calculations when applicable.
  - c. Additional loads or potential loads caused by geologic conditions (parameters and calculations).
5. Engineering calculations with supporting data and applicable parameters used as a basis for recommended values. These will be needed depending on the values presented relative to the foundation materials, groundwater table, proposed improvements and imposed loads.

### G. Retaining Walls: Design Criteria on Proposed Walls (surcharged or greater than 3 feet in height above the base).

1. Slope surcharge and geologic surcharge factors, parameters and calculations.
2. Drainage and backfill requirements including waterproofing of living areas and suitable drains.
3. Allowable bearing values, lateral bearing resistance and coefficient of friction based on testing or U.B.C. (Chap. 29).
4. Active, passive, or at rest lateral pressure.
5. Footing setback from base of slopes.

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### H. Conclusions and Recommendations

1. Corrective or selective grading.
2. Subgrade specifications and recommendations.
3. Soil cement or lime stabilization.
4. Rock clast disposal.
5. Blasting.
6. Irrigation/drainage controls, dewatering, surface and subsurface drains and sub drains.
7. Special planting and irrigation measures, slope coverings and other erosion control measures which may be apparent from the preparation of the geotechnical report.
8. Slough walls (including free board on retaining walls).
9. Protection of existing structures during grading.
10. Foundation/wall excavation inspections and approval by engineering geologist and/or soil engineer.
11. Shoring requirements.
12. Actual or potential effects extending into site from adjacent areas or from the site into adjacent areas and recommendations pertaining to stability, erosion, sedimentation, groundwater, etc.
13. Stabilization measures (see note under item C for guidelines and minimums).
  - a. Fill blankets for pads or stabilization blankets for slopes.
  - b. Stabilization fills: specifications (including sub drains and landscape) and parameters (including stability analysis and calculations if geologically surcharged).
  - c. Buttress fills: specifications (including landscape), sub drains, stability analysis with calculations and supporting test data and parameters.
14. Fill over cut slope specifications and recommendations.

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15. Subsidence, hydrocollapse primary consolidation and secondary compression, angular distortion, differential settlement and piping potential, factors, time frame and recommendations.

### PART IV: TECHNICAL GUIDELINES FOR PRELIMINARY SOIL AND GEOLOGY REPORTS ON PRECISE COMMERCIAL/INDUSTRIAL GRADING APPLICATIONS

This section includes the necessary report content in addition to Part I and applicable items of Part II and III for the proposed commercial/industrial development.

#### A. Pavement Design (indicate areas and type on geotechnical plan).

##### 1. AC pavement design criteria

- a. R-value testing: method (California 301-f or equivalent), results, sample location(s); or provide minimum AC sections per excavation and grading code.
- b. Traffic indices or projected loading conditions.
- c. AC structural sections: parking areas, access areas, service areas, heavy vehicle areas.
- d. Untreated base compaction recommendations (min. 95% re. comp.).
- e. Subgrade recommendations: minimum depth, compaction (min. 90% rel. comp.); special recommendations for bridging, or founding, e.g., soil cement or lime treatment, overexcavation, selective grading, etc.

##### 2. Concrete pavement

- a. Minimum thickness and reinforcement.
- b. Size of poured or sawed sections; expansion joints.
- c. Untreated base specifications and recommendations.
- d. Subgrade recommendations.

#### B. Seismic evaluation of site (if site involves a critical or major structure or is in close proximity to an active fault); see Part III for description of necessary content.



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### PART V: TECHNICAL GUIDELINES FOR PRELIMINARY SOIL AND GEOLOGY REPORTS ON RESIDENTIAL OR COMMERCIAL/INDUSTRIAL SUBDIVISIONS (TRACTS AND PARCELS); FLATLAND OR HILLSIDE AREAS

This section includes necessary report contents in addition to Part I and the applicable items of Parts II and III.

- A. Seismic evaluation of site (see Part III for description of necessary content).
- B. Evaluation of expansivity of site.
- C. Stability evaluation of site; slopes, tract boundary areas, etc.

### PART VI: TECHNICAL GUIDELINES FOR ROUGH GRADE COMPACTION REPORTS

#### A. General

- 1. Signature and RCE or CEG number of project soil engineer.
- 2. Job address, lot and tract number.
- 3. Grading Permit Number.

#### B. Placement of fill

- 1. Purpose for which fill was placed.
- 2. Preparation of natural grade to receive fill.
- 3. Placement of fill (depth of layers, watering, etc.)
- 4. Equipment used for compaction.
- 5. Method of compacting outer slope area.

#### C. Testing (Compaction)

- 1. Test procedure (field and laboratory).
- 2. Plot plan with the location of all density tests.
- 3. Summary of test results
  - a. Test identification number.

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- b. Date test performed.
- c. Maximum dry density.
- d. Optimum moisture.
- e. Field dry density.
- f. Field moisture.
- g. Relative compaction.
- h. Approximate elevation of test.
- i. Approximate finish grade elevation at test site.

### D. Testing (Utility Trench Compaction)

- 1. Location of test.
- 2. Depth of trench and test.
- 3. Method of backfill and compaction equipment.
- 4. Summary of test results.

### E. Testing (Other)

- 1. Summary of expansion test results (identify lots or areas with swelling potential, plot test locations on plot plan).
- 2. Summary of soluble sulfate test results.
- 3. Summary of "R" value tests for asphalt concrete design if applicable.

### F. As-Built Conditions

- 1. Plot plan showing limits of the approved compacted fill areas (approximate pad elevation, depth of fill, areas of overexcavation, canyon cleanout, keys, and sub drains).
- 2. Treatment of "daylight" or cut/fill transition zones (extent of over-excavation outside of footing).
- 3. Type of soil encountered during grading (fill, in-situ, imported borrow).

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4. Groundwater conditions identified and sub drains or other methods used to mitigate adverse effects.
5. Geologic conditions encountered.
6. Comments on changes made during grading and their effect on the recommendations made in the geotechnical report.
7. Slope stability analyses has been performed for cut slopes greater than 30 feet in height.

### G. Recommendations and Opinions

1. Footing recommendations and bearing value on compacted fill.
2. Footing and floor slab recommendations based on results of expansion and soluble sulfate tests (construction details of footing if applicable).
3. Pavement structural section design recommendations and specifications if applicable.
4. Opinion of the suitability of natural soil to support the fill or structure.
5. Approval as the adequacy of the site for the intended use, as affected by soil engineering and/or geologic factors.
6. Opinion as to the gross and surficial stability of all slopes.
7. Opinion as to the suitability of utility trench and retaining wall backfill.
8. A statement that the soil engineering and engineering geologic aspects of the grading have been inspected and are in compliance with the applicable conditions of the Grading Permit and the soil engineer's and engineering geologist's recommendations.

APPENDIX C  
SECURITY BOND FORMS

CITY OF MURRIETA  
GRADING PERMIT SURETY BOND

KNOW ALL MEN BY THESE PRESENTS: That \_\_\_\_\_,  
as Principal, and \_\_\_\_\_, a  
corporation organized and existing under the laws of the State of \_\_\_\_\_,  
and duly authorized to transact a surety business in the State of California, as Surety, are held and  
firmly bound unto the City of Murrieta in the just and full sum of \_\_\_\_\_ DOLLARS, for the  
payment of which, well and truly to be made, said Principal and Surety bind themselves, their  
heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT,

WHEREAS, the said Principal above names is applicant under Grading Permit  
No. \_\_\_\_\_ of the City of Murrieta, California, for grading, on the following described  
property:

NOW, THEREFORE, IT IS AGREED that if the Principal shall:

- a. Comply with all the provisions of the City Grading and Excavation Code and other applicable laws and ordinances; and
- b. Comply with all the terms and conditions of the permit to the satisfaction of the City Engineer; and
- c. Complete all of the work contemplated under the said permit within the time limit specified in the permit, and any extension or extensions thereof; and
- d. Reimburse the City for any work required by the permit that the City Engineer deems necessary to complete, correct or otherwise undertake for the public safety, because of failure on the part of Principal, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

PROVIDED, HOWEVER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or modification of the permit or of the work to be performed there under shall in any way affect its obligation on this bond and it does hereby waive notice of any such change, extension of time, alteration or modification of the permit or of work to be performed there under, and

PROVIDED FURTHER, that in case suit is brought upon the bond by the City or any other person who may bring an action on this bond, a reasonable attorney's fees, to be fixed by the court, shall be paid by the Principal or Surety.

IN WITNESS WHEREOF, the said Principal and said Surety have caused these presents to be duly signed and sealed this  
\_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Principal  
(Attach acknowledgement)

By \_\_\_\_\_  
Surety  
(Attach acknowledgement)

By \_\_\_\_\_

Attorney-in-Fact  
Address:

**LETTER OF CREDIT**  
For Grading and Erosion  
Control Agreement

CITY OF MURRIETA  
26442 Beckman Court  
Murrieta, California 92562

ATTENTION: City Engineer

REFERENCE: Irrevocable Letter of Credit No. \_\_\_\_\_

Gentlepersons:

We hereby establish our Irrevocable Letter of Credit number \_\_\_\_\_, in the amount of \_\_\_\_\_ U.S. Dollars (\$) in favor of the City of Murrieta, a municipal corporation of the State of California, hereinafter referred to as "City", issued in connection with the requirements of that certain agreement entered into between City and \_\_\_\_\_, hereinafter referred to as "Principal", covering grading done at: \_\_\_\_\_ for that certain subdivision known and designated as \_\_\_\_\_ by Principal and in accordance with said agreement.

This Letter of Credit is available to City against City's draft(s) drawn at sight on us when accompanied by:

City's written statement (signed by the City Engineer, City Manager, or City Attorney) certifying that there has been failure of the Principal to adhere to the provisions of the above agreement and further that the amount of the draft accompanying this statement is now due and payable.

Partial drawings are permitted.

All drafts under this Letter of Credit shall be marked "Drawn under Irrevocable Letter of Credit Number \_\_\_\_\_ issued \_\_\_\_\_ by \_\_\_\_\_." (Bank and address)

This Letter of Credit expires one year from the date hereof and shall be deemed automatically extended without amendment for a one-year period upon such date and upon each anniversary of such date, unless at least sixty (60) days prior to such date or each anniversary of such date we notify the City Clerk in writing by registered mail that we elect not to so extend this Letter of Credit. Upon receipt by City of such notice City may automatically draw the full amount remaining on this Letter of Credit by a clean draft, with no supporting documents, and Bank will pay City upon receipt of such draft.

We expressly agree with City that all drafts drawn under and in compliance with the terms of this Letter of Credit shall meet with due honor upon presentation. This Letter of Credit is subject to the Uniform Customs and Practices for Documentary Credits, 1983 Rev., published by the International Chamber of Commerce, ICC Publication 400, to the extent it is not inconsistent with applicable laws of the State of California.

Executed by Bank this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

BANK:

\_\_\_\_\_  
(name)

By: \_\_\_\_\_  
(signature of authorized agent)

\_\_\_\_\_  
(printed name of authorized agent)

(Letter must be submitted on bank letterhead.)

INSTITUTION APPROVED:

\_\_\_\_\_  
CITY OF MURRIETA  
Finance Director

APPROVED AS TO FORM;

By: \_\_\_\_\_  
City Attorney



**CITY OF MURRIETA**  
**GRADING AND EROSION CONTROL AGREEMENT**

NAME OF APPLICANT: \_\_\_\_\_  
(referred to as "Applicant")

DATE OF AGREEMENT: \_\_\_\_\_

GRADING PERMIT NO.: \_\_\_\_\_  
(referred to as "Grading Permit")

LOCATION: \_\_\_\_\_  
(referred to as "Grading Site")

OFFSITE LOCATION (IF ANY): \_\_\_\_\_  
(referred to as "Offsite Grading Location")

NAME OF DEVELOPMENT: \_\_\_\_\_  
(referred to as "Development")

GRADING PLAN NUMBER: \_\_\_\_\_  
(referred to as "Grading Plans")

SURETY/FINANCIAL INSTITUTION: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

TOTAL AMOUNT OF SECURITY: \_\_\_\_\_

AMOUNT OF SECURITY POSTED AS CASH DEPOSIT \_\_\_\_\_ RECEIPT NO. \_\_\_\_\_

AMOUNT OF SECURITY POSTED OTHER THAN CASH: \_\_\_\_\_

SECURITY FORM FOR AMOUNT OTHER THAN CASH: \_\_\_\_\_  
(Surety Bond, Letter of Credit)

This agreement is made and entered into by and between the City of Murrieta, California, a Municipal Corporation of the State of California, hereinafter referred to as City, and the Applicant.

**RECITALS**

A. The Applicant has applied for a Grading Permit, pursuant to the Murrieta Municipal Code (hereinafter referred to as "Code"), to perform grading work including excavation, fill, installation



of drainage facilities, installation of desiltation/retention basins, landscaping, erosion control or any combination thereof and storm damage protection, within the City of Murrieta, State of California, more specifically described in the application for Grading Permit referred to above and incorporated by reference herein.

B. Complete Grading Plans and specifications for the grading work to be performed under the Grading Permit, incorporated by reference herein, have been prepared by or at the request of the Applicant, approved by the City Engineer, and filed in the office of the City Engineer.

C. Grading work shall be performed in accordance with the Code, all City standards, specifications, and policies, and the Grading Plans as identified on Page 1 hereof. All grading work shall occur in the general location of the Grading Site and may include work at the Offsite Grading Location, as specified on Page 1.

D. An estimate of the cost of performing the grading work in connection with City requirements according to the Grading Plans has been submitted by the Applicant and approved by the City Engineer and is attached as Exhibit "A".

E. Sub article 7 of the Code requires the Applicant to post a bond with the City to cover the cost of the grading work prior to issuance of the Grading Permit.

F. The City Engineer may require pursuant to Sub article 7 of the Code that up to ten percent (10%) of the grading bond be posted as cash to ensure adequate safeguards for the prevention of erosion and sedimentation are in place when needed and be properly maintained and repaired. The applicant has the right to submit a cash deposit greater than ten percent.

G. The applicant has submitted cash in the amount stated on Page 1.

NOW, THEREFORE, in consideration of the issuance of the Grading Permit by the City, the Applicant and the City agree as follows:

1. **Applicant's Obligation to Perform Grading Work**

Applicant shall:

a. Complete at Applicant's expense all grading, drainage, landscape, storm damage and erosion, control work required by the Grading Permit in accordance with the Grading Plans, City standards, guidelines, manual and code.

b. Maintain any and all desiltation basins and other erosion control devices in a manner acceptable to the City Engineer. If the City Engineer determines that erosion control measures or devices are not adequate or are not being maintained in an acceptable manner, or that a hazardous condition exists due to erosion, or to work being done, applicant shall take immediate action to construct or install additional erosion control devices or repair the existing erosion control devices or correct the hazardous condition upon notification by the City Engineer. Notification will be made by telephone to the 24-hour emergency telephone number shown on the plans. If there is no answer at the emergency phone number or the contact person fails to initiate corrective action within the time specified by the City Engineer, then the City Engineer may cause corrective action to be taken and the costs of said corrective action shall be deducted from the cash deposit posted by the applicant. Funds

withdrawn by the City Engineer from the cash deposit required under the terms of this agreement shall be replaced by the applicant within five working days of notice from the City Engineer to do so. The City Engineer may order all work on the project stopped until such time as the cash deposit is restored to its original balance. This provision shall also apply to any existing offsite desiltation basins, which in the opinion of the City Engineer are impacted by siltation originating from the Applicant's development site.

c. Make an inspection of the desiltation basin(s) and other erosion control devices after each runoff producing rainfall and repair or restore the basin or device when the accumulation of silt reduces the design performance below acceptable levels in the opinion of the City Engineer.

d. Give good and adequate warning to the public of each and every dangerous condition present in or adjacent to the grading work and take all reasonable actions to protect the public from such dangerous conditions.

2. **Securing of Property Rights.** The applicant shall not commence any off-site grading until proof of all necessary and proper written legal permission or title is furnished to the City Engineer.

3. **Security.** Applicant shall at all times guarantee Applicant's performance of this agreement by furnishing to City and by maintaining good and sufficient security as required by Code on forms approved by City.

In accordance with Sub article 7 of the Code, the Applicant shall submit one or more forms of security based upon estimated cost of the grading work. The City Engineer may require that up to ten percent (10%) of the grading security be posted as a cash deposit.

The securities required by this agreement shall be kept on file with the City Clerk. The terms and conditions of the security posted with this agreement are incorporated into this agreement by this reference.

If any security is replaced by another security approved by City, the replacement shall be filed with the City Clerk and, upon filing, shall be deemed to have been made a part of and incorporated into this agreement. Upon filing of a replacement security with the City Clerk, the former security may be released.

4. **Inspection and Acceptance.** Applicant shall at all times maintain proper facilities and safe access for inspection of the grading work by City inspectors. Upon completion of the work the Applicant shall request a final inspection by the City Engineer. If the City Engineer determines that the work has been completed in accordance with this agreement, he shall certify the completion of the work. Applicant shall bear all costs of inspection and certification.

5. **Release of Security.** The Security required by this agreement shall be released as follows:

(1) Security given to guarantee performance of the grading and erosion control work as authorized pursuant to the Grading Permit shall be released upon acceptance of the work by the City Engineer subject to the provisions in Subsections (2), (3) and (4) of this section.

(2) Upon written application for release by Applicant, the City Engineer may release a portion of the security as grading is satisfactorily completed and accepted. The City Engineer shall not authorize a release of the grading and erosion control security to an amount,

in his or her opinion, below that required to guarantee the completion of any work or any other obligation imposed by Code, conditions of approval for the development, or this agreement.

(3) All or any portion of the cash security deemed necessary by the City Engineer, shall be retained to guarantee maintenance and repair of desiltation basins and other erosion control devices. The remaining cash security shall be released upon determination of the City Engineer that the development site has been adequately and permanently safeguarded against erosion and all temporary desiltation basin and erosion control devices have been removed to the satisfaction of the City Engineer.

(4) The City may retain from the security released an amount sufficient to cover costs, reasonable expenses and fees, including reasonable attorney's fees.

6. **Injury to Public or Private Improvements and Property.** Applicant shall indemnify the City pursuant to Paragraph 10 and replace, or repair, or pay to the owner, the entire cost of replacement or repairs of any property damaged or destroyed by reason of any work done hereunder, whether such property is owned by the United States or any agency thereof, or the State of California or any agency or district or political subdivision thereof, or any public or private corporation, or by any person, or by any combination of such owners. Any such repair or replacement shall be to the satisfaction and subject to the approval of the City Engineer.

7. **Permits.** At Applicant's expense, Applicant shall obtain all necessary permits and licenses for the construction and installation of the improvements, give all necessary notices and pay all fees and taxes required by law.

8. **Default of Applicant.** In the event Applicant fails to perform any work required by this agreement, City may perform work twenty (20) days after mailing written Notice of Default to Applicant and to Applicant's Surety. Applicant agrees to pay the entire cost of such performance by City.

The sums provided by this security agreement may be used by City to complete the work in accordance with plans and specifications contained herein.

If Applicant does not perform the work in a timely manner as determined by the City Engineer, City may take over the work and prosecute the same to completion by contract or by any other method City deems advisable, for the account and at the expense of Applicant. Applicant's Surety shall be liable to City for any excess cost or damages occasioned by City. In such event, City, without liability for so doing, may take possession of and utilize in completing the work such materials, appliances, plant and other property belonging to Applicant as may be on the site of the work and necessary therefore. Applicant agrees not to remove such property from the site.

In the event Applicant fails to perform any obligation hereunder, Applicant agrees to pay all costs and expenses incurred by City in securing performance of such obligations, including cost of suit and reasonable attorney's fee.

9. **Applicant Not Agent of City.** Neither Applicant nor any of Applicant's agents or contractors are or shall be considered to be agents of the City in connection with the performance of Applicant's obligations under this agreement.

10. **Indemnity/Hold Harmless.** Neither the City nor any officer, agent or employee thereof shall be liable for any injury to persons or property occasioned by reason of the acts or

omissions of Applicant, or their agents or employees, in the performance of this agreement. Applicant further agrees to defend and hold harmless City, its officials and employees from any and all claims, demands, causes of action, liability or loss of any sort, because of, or arising out of, acts or omissions of Applicant, its agents or employees in the performance of this agreement, including all claims, demands, causes of action, liability, or loss because of or arising out of, in whole or in part, the design or construction of the grading and erosion control work; provided however, that the approved grading and erosion control security shall not be required to cover the provisions of this paragraph. Said indemnification and agreement to defend and hold harmless shall extend to injuries to persons and damages to or taking of property resulting from the design, construction or grading as provided herein, and in addition, to adjacent properties and improvements located thereon as a consequence of the diversion of waters from the design or construction of drainage systems, private streets, grading and other development improvements.

Acceptance by the City of the grading work shall not constitute an assumption by the City of any responsibility for any damage or taking covered by this paragraph. City shall not be responsible for the design or construction of the development or the grading work pursuant to the approved Grading Plans regardless of any action or inaction taken by the City in approving the plans, unless the particular grading and erosion control design was specifically required by City over written objection by Applicant submitted to the City Engineer before approval of the particular grading and erosion control design, which objection indicated that the particular grading and erosion control design was dangerous or defective and suggested an alternative safe and feasible design.

After acceptance of the grading work, the Applicant shall remain obligated to eliminate any defect in design or any dangerous condition caused by the design or grading but, if not in ownership of the property, shall not be responsible for routine maintenance. Provisions of this paragraph shall remain in full force and effect for ten years following the acceptance by the City of grading work. It is the intent of this section that Applicant shall be responsible for all liability for design and construction of the grading and erosion control work done pursuant to this agreement and that City shall not be liable for any act or omission in approving, reviewing, checking, or correcting any plans or specifications or in approving, reviewing or inspecting any work or grading.

11. **Sale or Disposition of Development.** Sale or other disposition of this property will not relieve Applicant from the obligations set forth herein. If owner sells the property or any portion of the property within the development to any other person, the Applicant may request a novation of this agreement and a substitution of security. Upon approval of the novation and substitution of securities, the Applicant may request a release or reduction of the securities required by this agreement. Nothing in the novation shall relieve the Applicant of the obligations under Paragraph 10 for the work or improvement done by Applicant.

12. **Time is of the Essence.** Time is of the essence in this agreement.

13. **Time for Commencement of Work; Time Extensions.** Applicant shall commence substantial construction of the grading and erosion control work not later 180 days after the date of issuance of the Grading Permit as stated on the Grading Permit. In the event good cause exists as determined by the City Engineer, the time of commencement of construction or expiration of the Grading Permit may be extended. The extension shall be made in writing by the City Engineer. Any

such extension may be granted without notice to the Applicant's Surety and shall in no way affect the validity of this agreement or release the surety on any bond given for the guarantee of performance of this agreement. As a condition of such extension, the City Engineer may require Applicant to furnish new security guaranteeing performance of this agreement as extended in an increased amount as necessary to compensate for any increase in construction cost as determined by the City Engineer.

14. **No Vesting of Rights.** Performance by Applicant of this agreement shall not be construed to vest Applicant's right with respect to any change in any zoning or building law or ordinance.

15. **Notices.** All notices required or provided for under this agreement shall be in writing and delivered in person or sent by mail, postage prepaid and addressed as provided in this paragraph. Notice shall be effective on the date it is delivered in person, or, if mailed, on the date of deposit in the United States Mail. Notices shall be addressed as follows unless a written change of address is filed with the City:

Notice to City:  
City Engineer  
26442 Beckman Court  
Murrieta, CA 92562

Notice to Applicant:

Notice to Surety:

16. **Severability.** The provisions of this agreement are severable. If any portion of this agreement is held invalid by a court of competent jurisdiction, the remainder of the agreement shall remain in full force and effect unless amended or modified by the mutual consent of the parties.

17. **Captions.** The captions of this agreement are for convenience and reference only and shall not define, explain, modify, limit, exemplify, or aid in the interpretation, construction or meaning of any provision of this agreement.

18. **Litigation or Arbitration.** This agreement may be enforced by litigation or arbitration at City's election and in that event, the prevailing party shall be entitled to costs and reasonable attorney's fees in enforcing the terms of this agreement.

19. **Incorporation of Recitals.** The Recitals to this agreement are hereby incorporated into the terms of this agreement.

20. **Entire Agreement.** This agreement constitutes the entire agreement of the parties with respect to the subject matter. All modifications, amendments, or waivers of the terms of this

agreement must be in writing and signed by the appropriate representatives of the parties. In the case of the City, the appropriate party shall be the City Manager.

Executed by Applicant this \_\_\_\_ day of \_\_\_\_, 20\_\_.

**APPLICANT:**

See note below

\_\_\_\_\_  
(Type or print name of Organization on line)

By: \_\_\_\_\_

Attach notary  
acknowledgement

(Type or print name and title)

(sign here)

By: \_\_\_\_\_

(Type or print name and title)

(sign here)

**CITY OF MURRIETA** a municipal corporation of the State of California

By \_\_\_\_\_  
City Engineer

(NOTE: President **or** vice-president **and** secretary/treasurer **or** assistant secretary must sign for corporations. If only one officer signs, the corporation must attach a resolution certified by the secretary or assistant secretary under corporate seal empowering that officer to bind the corporation.)

APPENDIX D

MINIMUM STANDARDS FOR SLOPE STABILITY ANALYSIS

(LA/ASCE Geotechnical Group Committee on  
Seismic Stability of Soil and Rock)

## MINIMUM STANDARDS FOR SLOPE STABILITY ANALYSIS

The following minimum standards for slope stability analysis will generally be required for fill slopes steeper than 2:1 [Section 7010 (e)] and cut slopes steeper than 2:1 [Section 7009 (b)]. A more detailed field and laboratory investigation combined with a seismic stability analysis utilizing such information may be required where unusual soils or geologic conditions exist.

1. Separate calculations shall be performed for static and seismic conditions.
2. The pseudostatic slope stability analysis shall be the minimum seismic analysis accepted for design.
3. Conventional static methods of slope stability analysis based upon principles of mechanics may be used to analyze the stability of slopes under both static and pseudostatic loads.
4. The minimum acceptable factor of safety on shear strength is 1.5 for static loads and 1.1 for pseudostatic loads. the factor of safety on strength is defined as the ratio of the shearing resistance force to the actual driving force acting along the potential failure surface.
5. The static analysis shall include the effect of expected maximum moisture conditions, soil weight and seepage or pore pressure where applicable. Saturated moisture conditions shall be utilized unless it can be shown that other moisture contents will represent worst possible conditions for the project.
6. Pseudostatic analysis shall include the effect of static loads combined with a horizontal inertial force acting out of the slope and through the center of gravity of the potential sliding mass.
7. A minimum pseudostatic horizontal inertial force equal to 0.15 times the total weight of the potential sliding mass shall be used. This minimum lateral design value should be increased where subsurface conditions or the proximity to active faults warrants the use of higher values in the opinion of the private consultant(s).
8. The critical potential failure surface used in the analysis may be composed of circles, planes or other shapes considered to yield the minimum factor of safety against sliding and most appropriate to the soil and geologic site conditions. In cohesive soils, a vertical tension crack extending down from the top of the slope to the potential failure surface may be used to limit the lateral extent of the potential sliding mass. In hard Rock (i.e., igneous [granitic or volcanic] or metamorphic rock), a three dimensional wedge-type slope stability analysis shall also be performed.
9. The critical potential failure surface having the lowest factor of safety on strength shall be sought for the static case. This same static surface and sliding mass may be assumed critical for the pseudostatic case.
10. Soil properties including unit weight and strength parameters (cohesion and friction angle) may be based on conventional field and laboratory tests and/or field performance. Where



appropriate, laboratory tests for long-term residual strengths shall be performed. Shear resistance along bedding planes normally requires estimation of bedding-strength values of the weakest unsupported plane. It is expected that the engineer will use considerable judgment in the selection of appropriate shear tests and interpretation of the results in arriving at strength characteristics fitting the present and anticipated future slope conditions. Dynamic strengths used in a pseudostatic analysis shall not exceed peak point static strengths unless supported by dynamic test results or other convincing physical evidence.

11. In the design of slope support, bedding planes flatter than 12 degrees from the horizontal need not normally be considered in a pseudostatic analysis.
12. Each slope stability analysis shall be accompanied by a geotechnical report including a summary of the results of field exploration and laboratory investigation. This report should at least include the following items:
  - a. Boring logs and plan locations relative to the proposed grading.
  - b. Geotechnical description of soil and/or rock encountered in the proposed cut slope and/or expected to be used in the proposed fill. Soil description should include engineering classification with moisture and density or stiffness. Rock description should include, but not be limited to: geologic assessment of hardness, degree of weathering, strata thickness, clay surfaces and oriented planar discontinuities such as strike and dip of bedding, joint spacing, joint thickness, fracture and fault surfaces.
  - c. Groundwater conditions encountered at the site as well as anticipated future groundwater conditions that may affect the design.
  - d. Description of laboratory tests performed with summary of laboratory test results. Both the moisture and drainage conditions during any shear strength tests should be clearly defined.
  - e. Shear strength parameters for design which are based on field experience should be properly referenced or explained.
13. All design parameters shall be verified during construction. This includes applicable geologic structures - such as bedding attitudes, joint orientation and existing shear surfaces - fill strength, and groundwater conditions. If any significant variation from the design values is discovered, revised calculations shall be made and submitted.

APPENDIX E  
RIVERSIDE COUNTY BUILDING AND SAFETY  
FORM 284-41

COUNTY OF RIVERSIDE

DEPARTMENT OF BUILDING AND SAFETY

The following is a list of four grass mixtures that produce ground covers which will minimize erosion on slopes.

The mixtures when seeded must be given adequate moisture to insure germination. If the mixtures are given ample time to grow and develop a good root system (prior to heavy rains) erosion control should be achieved. In emergency situations where erosion control is necessary in a short period of time the rates shown below should be doubled.

(1) Barley	2 lbs/1000 sq. ft.
Annual Ryegrass	1 1/4 lbs/1000 sq. ft.
(2) Alto or Meadow Fescue	1/2 lb/1000 sq. ft.
Kentucky Blue Grass	1/4 lb/1000 sq. ft.
Birdsfoot Trefoil*	1/5 lb/1000 sq. ft.
(3) Perennial Ryegrass	3/4 lb/1000 sq. ft.
Barley	2 lbs/1000 sq. ft.
Birdsfoot Trefoil or Clover	1/3 lb/1000 sq. ft.
(4) Blando Brome	1/2 lb/1000 sq. ft.
Lana Vetch	1/2 lb/1000 sq. ft.

\*Birdsfoot Trefoil needs warm weather to germinate.

Ground covers that provide slope protection may be selected from the recommendations listed below or substitutes may be obtained from an Erosion Control Specialist.

The recommended list of plants was primarily selected because of the plants' growing habit, drought resistance, fire resistance and availability. It is important to note that ground covers need a continuous source of moisture and some maintenance to maintain vigorous growth.

<u>NAME</u>	<u>SPACING</u>	<u>DROUGHT RESISTANCE</u>	<u>MODERATE FIRE RESISTANCE</u>
Trailing African Daisy	12"	Fair-Good	Yes
Rosemary	2'	Excellent	
Trailing Ganzania	18"-24"	Good	Yes
Aarons Beard	12"-15"	Good-very good	
Trailing Lantana	18"-24"	Fair-good	
Dwarf Coyote Brush	2'	Excellent	

<u>NAME</u>	<u>SPACING</u>	<u>DROUGHT RESISTANCE</u>	<u>MODERATE FIRE RESISTANCE</u>
Lippia	15"	Very Good	Yes
Halls Honeysuckle	2'-3'	Fair	Yes
Periwinkle	2'	Good	Yes
Dwarf Periwinkle	2'	Good	Yes