

IMPROVEMENT STANDARDS



FOR

THE COUNTY OF FRESNO

Adopted: October 1966

SECTION II - DESIGN

H. GEOTECHNICAL REPORTS

1. INTRODUCTION

Geotechnical reports are of the following nature:

Geologic
Soils Engineering
Groundwater Supply
Sewage Disposal

For a given project, any of the individual evaluations may be required. If the project warrants, all four may be combined into a Project Geotechnical Evaluation.

When the Ordinance Code requires either a Soil Report, (§17.32.030), a Geological Survey (§17.28.050Y3 and 4), Water Supply Evidence and the water supply is to be provided by wells or springs, (§17.48.310 A and C, 17.28.050X, and 17.72.360), Sewerage Requirement Evidence (§17.72.360 and 17.28.068I) such reports, surveys or evidence shall consist of onsite evaluations and be compiled from the following guidelines:

a. Purpose:

The purpose of such surveys, reports or evidence is to provide the County Departments of Health, Planning, Public Works and Resources and Development sufficient information for interpretation of the onsite conditions of the proposed development and surrounding affected areas to enable them to:

- 1) Determine the nature of the physical improvements, which will be required in the development to meet the requirements of the Developer and the County Ordinance Code; and
- 2) Evaluate both the capability of the area on which the development will be built to absorb the developments and the impact such development may have on the environment.

b. Professional Qualification

Such surveys, reports and evidence will be prepared by professionals who have been approved by the County Director of Resources and Development. In order to be approved, the professional (in accordance with the appropriate provisions of Chapters 7 and 12.5 of Division 3 of the State Business and Professions Code) must meet one of the following qualifications:

- 1) Be a Certified Engineering Geologist, as provided for in Chapter 12.5; or

- 2) Be a Registered Geologist, as defined in Chapter 12.5; or
- 3) Be a Registered Civil Engineer, as defined in Chapter 7. Each of the above shall accept the responsibility for the Report, insofar as Chapters 7 and 12.5 legally allow them to do so.

In so much as the surveys, reports and evidence will require extensive soil, hydrology and groundwater expertise, the persons selected to conduct the various portions of the study must have a minimum of three years' experience in these fields of study, or be in consortium with individuals having this experience.

The contents of the Report(s) shall be the responsibility of the professional or professionals who prepare it. The preparers will use their professional judgment in determining the contents of the report(s). However, the reviewing Departments will expect the Report to be prepared in accordance with, and to contain appropriate portions of the following sections. It is recommended that the preparer of the Report consult with the reviewing Departments as to the appropriate content of the Report prior to the beginning of the work. However, final approval of the report will remain with the Director of Resources and Development, and will not be made until the comments of all reviewing Departments are jointly considered.

c. Distribution

Seven copies of the required report or combination of reports shall be presented to the Director of Resources and Development, not later than the time Tentative Map is filed. The Director will distribute the Report to other affected Departments. It is recommended that the Report be submitted at an earlier date to provide these Departments sufficient time to complete their review prior to formal submission of the Tentative Map, in order to preclude the possibility of the redesign of the lots or the elimination of portions of the proposed subdivisions.

d. General Information: Each report should include definite statements concerning the following matters:

- 1) Location and side of subject area, and its general setting with respect to major geographic and geologic features.
- 2) Who did the related mapping upon which the report is based, and when was the mapping done?
- 3) Any other kinds of onsite investigations made by the professional, and where pertinent, reasons for doing such work.
- 4) Topography and drainage in the subject area.
- 5) Distribution and general nature of exposures of earth materials within the area (soils, bedrock, etc.).

- 6) Nature and source of available subsurface information. Suitable explanations should provide any technical reviewer with the means for assessing the probable reliability of such data. Subsurface relationships can be variously determined or inferred, for example, by projection of surface features from adjacent areas, by the use of test-hole logs, and by interpretation of geophysical data, and it is evident that different sources of such information can differ markedly from one another in degree of detail and reliability, according to the method used.

2. MAPPING:

a. Geologic Mapping:

- 1) Each report must be a product of independent geologic mapping of the subject area, at an appropriate scale, and in sufficient detail, to yield a maximum return of pertinent data. In connection with this objective, it may be necessary for the professional to extend his mapping into adjacent areas.
- 2) All mapping should be done on a base with satisfactory horizontal and vertical control (in general, a detailed topographic map). The nature and source of the base map should be specifically indicated. For subdivisions, the base map should be the same as that to be used for the tentative map or grading plan.
- 3) Mapping by the professional should reflect careful attention to the lithology, structural elements and three-dimensional distribution of the earth materials exposed or inferred within the area. In most hillside areas, these materials will include both bedrock and surficial deposits. A clear distinction should be made between observed and inferred features and relationships.
- 4) A detailed, large-scale map normally will be required for a report on a tract, as well as for a report on a smaller area, in which the geologic relationships are complex.
- 5) Where three-dimensional relationships are significant, but cannot be described satisfactorily in words alone, the report should be accompanied by one or more appropriately positioned structure sections.
- 6) The locations of test holes and other specific sources of subsurface information should be indicated in the text of the report, or better, on the map and any sections that are submitted with the report.

b. Hydrologic Mapping

Hydrologic mapping, when required, shall be prepared at the same scale as the geologic map. The map shall clearly delineate those areas in which groundwater exists within ten feet of the ground surface and where bedrock

or other impermeable layers exist within five feet of the ground surface. It shall also depict:

- 1) Distribution and occurrence (e.g.: streams, ponds, swamps, springs, seeps, subsurface basins).
- 2) Relations to topography. (How do streams, ponds, swamps, springs, seeps, etc., relate to topography?)
- 3) Relations to geologic features (e.g.: previous strata, fractures, faults).
- 4) Sources and permanence.
- 5) Variations in amount of water (e.g.: intermittent springs and seeps, floods).
- 6) Evidence for earlier occurrence of water at localities now dry (e.g.: vegetation, mineral deposits, and historic records).
- 7) The effect of water on the properties of the in-place materials.

3. GEOLOGIC REPORT:

The report should contain brief, but complete descriptions of all natural materials and structural features, recognized or inferred, within the subject area. Where interpretations are added to the recording of direct observations, the bases for such interpretations should be clearly stated.

The following checklist may be useful as a general, though not necessarily complete guide for descriptions:

- a. Bedrock (igneous, sedimentary, metamorphic types):
 - 1) Identification as to rock type (e.g.: granite, silty sandstone, mica schist).
 - 2) Relative age, and where possible, correlation with named formations (e.g.: Rincon formation, Vaqueros sandstone).
 - 3) Distribution.
 - 4) Dimension features (e.g.: thickness, outcrop breadth, vertical extent).
 - 5) Physical characteristics (e.g.: color, grain size, nature of stratification, foliation or schistosity).
 - 6) Special physical or chemical features (e.g.: calcareous or siliceous cement, concretions, mineral deposits, alteration other than weathering).
 - 7) Distribution and extent of weathered zones; significant differences between fresh and weathered rock.

- 8) Response to natural surface and near-surface processes (e.g.: Gullying, Mass movement).
- b. Structural Features: Stratification, foliation, schistosity, folds, zones of contortion or crushing, joints, shear zones, faults, etc.
- 1) Occurrence and distribution.
 - 2) Dimensional characteristics.
 - 3) Orientation, and shifts in orientation.
 - 4) Relative ages (where pertinent).
 - 5) Special effects upon the bedrock. (Describe the conditions of planar surfaces).
 - 6) Specific features of faults (e.g.: zones of gouge and breccia, nature of offsets, timing of movements); are faults active in either the geological sense or the historical sense?
- c. Surficial Deposits: Unconsolidated deposits, artificial (manmade) fill, topsoil, stream-laid alluvium, beach sands and gravels, residual debris, lake and pond sediments, swamp accumulations, dune sands, marine and non-marine terrace deposits, talus accumulations, creep and slope-wash materials, various kinds of slump and slide debris, etc.
- 1) Distribution, occurrence and relative age; relationships with present topography.
 - 2) Identification of materials as to general type.
 - 3) Dimensional characteristics (e.g.: thickness, variations in thickness, shape).
 - 4) Surface expressions and correlation with features such as terraces, dunes, undrained depressions, etc.
 - 5) Physical or chemical features (e.g.: moisture content, mineral deposits, Content of expansible clay minerals, alteration, cracks and fissures, fractures).
 - 6) Physical characteristics: (e.g.: color, grain size, hardness, compactness, coherence, and cementation).
 - 7) Distribution and extent of weathered zones; significant difference between fresh and weathered material.
 - 8) Response to natural surface and near-surface processes (e.g.: gullying, subsidence, creep, slope washing, slumping and sliding).

- d. Features of Special Significance (if not already included in foregoing descriptions).
- 1) Features representing accelerated erosion (e.g.: cliff retreat, badlands, advancing gully heads).
 - 2) Features indicating subsidence or settlement (e.g.: fissures, scarplets, offset reference features, historic records and measurements).
 - 3) Features indicating creep (e.g.: fissures, scarplets, distinctive patterns of Cracks and/or vegetation, topographic bulges, displaced or tilted reference features, historic records and measurements).
 - 4) Slump and slide masses in bedrock and/or surficial deposits; distribution, geometric characteristics, correlation with topographic and geologic features, age and rates of movement.
 - 5) Deposits related to recent floods (e.g.: talus aprons, debris ridges, canyon-bottom trash).
 - 6) Active faults and their recent effects upon topography and drainage.

4. BEARING OF GEOLOGICAL FACTORS UPON THE INTENDED LAND USE:

This section shall contain specific recommendations concerning the feasibility of the project, as affected by the site's geology, and if necessary, an analysis of the property on a lot-by-lot basis. Specific recommendations for the correction of all known and anticipated hazards on the project shall be included. This section involves the evaluation of both: 1) the effects of geologic features upon any proposed grading, construction and land, use; and 2) the effects of these proposed modifications upon future geologic processes in the area.

The following checklist includes the topics that ordinarily should be considered in submitting discussion, conclusions and recommendations from a geologic perspective:

a) Compatibility of Natural Features

General compatibility of natural features with proposed land use, to determine if it is basically reasonable to develop the subject area.

- 1) Topography
- 2) Lateral stability of earth materials
- 3) Problems of flood inundation, erosion and deposition
- 4) Problems cause by features or conditions in adjacent properties
- 5) Other general problems

- b) Proposed Cuts
 - 1) Prediction of what materials and structural features will be encountered
 - 2) Prediction of stability, based on geologic factors
 - 3) Problems of excavating (e.g.: unusually hard or massive rock, excessive flow of ground water)
 - 4) Recommendations for reorientation or repositioning of cuts, reduction of cut slopes, development of compound cut slopes, special stripping above daylight lines, buttressing, protection against erosion, handling of seepage water, setbacks for structures above cuts, etc.
- c) Proposed Masses of Fill
 - 1) General evaluation of planning, with respect to canyon filling and side hill masses of fill
 - 2) Comment on suitability of existing natural materials for fill
 - 3) Recommendations for positioning of masses, provision for underdrainage, buttressing, special protection against erosion
- d) Special Recommendations
 - 1) Areas to be left as natural ground
 - 2) Removal or buttressing of existing slide masses
 - 3) Flood protection
 - 4) Problems of ground water circulation (e.g.: flow pattern modification due to pumpage or interruption of recharge).
 - 5) Position of structures with respect to active faults.

5. SOIL ENGINEERING AND GRADING:

When a soil engineering report is required, it should include a map of all proposed grading sites. The map should also include accurate locations of all subsurface exploratory test wells, pits or borings.

The Report should describe all proposed grading on the project, giving the location, topographic relief, drainage, rock and soil types in the areas to be graded, the grading proposed and the effects of such grading on the site and adjoining properties. Cut and fill slope stability analyses should be included to substantiate recommendations concerning the vertical height and angle of all slopes on the project.

The Report should be sufficient to outline existing and anticipated soil problems, and recommend solutions to these problems, and should indicate wherever proposed grading or other proposed improvements might adversely affect the existing or future stability of the site.

The Report should include an analysis of the surface and subsurface effect of water from rainfall, irrigation, private and community sewage disposal systems, runoff from proposed grading or other probably sources from both the subdivision and adjoining properties, wherever such water is likely to reduce the surface or subsurface stability, cause erosion, or sedimentation, reduce infiltration to ground water, increase runoff to streams, or cause degradation of the ground water underlying the subdivision of adjoining properties.

The following list includes the topics that ordinarily should be considered in submitting discussion, conclusions, and recommendations from an Engineering perspective, in the soil engineering report.

a) Compatibility of Natural Features

General compatibility of natural features with proposed land use to determine if it is basically reasonable to develop the subject area.

- 1) Topography
- 2) Lateral stability of earth materials
- 3) Problems of flood inundation, erosion and deposition
- 4) Problems caused by features or conditions in adjacent properties
- 5) Other general problems

b) Proposed Cuts

- 1) Prediction of what materials and structural features will be encountered
- 2) Prediction of stability based on soils-related factors
- 3) Problems of excavating (e.g.: unusually hard or massive rock, excessive flow of groundwater)
- 4) Recommendations for reorientation or repositioning of cuts, reduction of cut slopes, development of compound cut slopes, special stripping above daylight lines, buttressing, protection against erosion, handling of seepage water, setbacks for structures above cuts, etc.

c) Proposed Masses of Fill

- 1) General evaluation of planning, with respect to canyon filling and side hill masses of fill

- 2) Comment on suitability of existing natural materials for fill
 - 3) Recommendations for positioning of fill masses, provision for underdrainage, buttressing, special protection against erosion
- d) Special Recommendations
- 1) Areas to be left as natural ground
 - 2) Removal or buttressing of existing slide masses
 - 3) Flood protection
 - 4) Problems of groundwater circulation (e.g.: flow pattern modification due to modification, due to pumpage or interruption of recharge)
 - 5) Position of structures with respect to active faults

6. **SEISMIC CONSIDERATIONS:**

Where required, the following published guidelines should be considered when preparing seismic information.

CDMG Note No. 37, "Guidelines to Geologic/Seismic Reports"

CDMG Note No. 43, "Recommended Guidelines for Determining the Maximum Probable Earthquakes"

7. **GROUND WATER SUPPLY REPORT:**

If it is proposed that ground water is to be used to supply water to the subdivision, a complete, hydrogeological examination shall be made. Wells should be tested during the time of year when ground water conditions can be expected to be most stressed. If private wells are proposed to be used, the Report shall contain estimated minimum and maximum installation costs, including drilling, of private water wells. These costs shall be for the year the subdivision map is recorded.

a) Hydrogeological Examination

The Hydrogeological Examination shall contain appropriate hydrologic maps, an evaluation of ground water occurrence, depth, movement, recharge, discharge, storage capacity and chemical characteristics. Conclusions shall be submitted as to: 1) The amount of ground water available for the entire development during the most adverse series of dry years; 2) The expected availability of water under full development at future increments of time; 3) The predicted regional ground water decline, with time due to pumping for the development; 4) Whether the proposed method of obtaining the water (e.g. the individual wells or community water supply) is feasible; 5) The anticipated depths and yields of recommended wells; 6) The chemical and bacteriological quality of the water; 7) Type of well to be used; and 8) the adequacy of source data.

b) Geographical Area

The examination shall include the tentative subdivision area, and shall be extended peripherally, to include an estimate of the effects of development on existing uses of other property beyond the proposed subdivision. Potential adverse interaction effects between these onsite and offsite uses shall be described.

c) Conformance with Standards

All test wells which are utilized to indicate quantities of water available for domestic or other use shall be constructed in accordance with State of California Department of Water Resources Bulletin No. 74-81, entitled, "Water Well Standards," State of California dated December 1981, and title 14, Chapter 14.04 entitled, "Well Regulation-General Provisions," plus Chapter 14.08, entitled, "Well Construction, Pump Installation and Well Distraction Standards" of the Fresno County Ordinance Code.

d) Individual Domestic Well Test Procedures

If individual domestic wells are to be used, (as opposed to community wells) they shall be tested as follows:

- 1) The test will be 72 hours in duration (or longer, if the responsible Professional deems it appropriate), and will be divided into two phases. During the first eight hours (or longer) a constant discharge test will be performed. This data will be used to establish estimates of aquifer storage coefficient and transmissivity. The remaining 64 hours (or longer) will consist of a constant drawdown test. During this phase, the water level in the well shall be maintained below the lowest water bearing fracture. All water bearing fractures, and volume of flow from each, shall be clearly noted on the well log. If the well is in alluvium, the optimum pumping level shall be determined by the responsible professional. The purpose of the second phase is to aid in evaluating the potential long term yield of the well.

It should be emphasized that the magnitude of instantaneous well flow from this test will be only one criterion for judging long term yield. Its validity will be determined by comparison with other factors, such as recovery time, available recharge, available subsurface through-flow, and aquifer storage capacity in the vicinity of the well.

- 2) Records on the well performance shall include: 1) time-drawdown; 2) flow rate; 3) total pumpage; 4) water quality at the beginning of the test; and 5) water quality at the end of the test. 1) And 2) shall be used for semi log plots of yield vs. time. These plots will be included in the Report. All samples shall be tested for conductivity and such chemical and other components, as required by the health officer.

Recommended time intervals for time-drawdown plots:

<u>Time since Pumping</u>	<u>Time Intervals</u>
0-5 minutes	0.5 minutes
5-60 minutes	5.0 minutes
60-100 minutes	20 minutes
100 minutes-5 hours	30 minutes
5 hours-end of test	Discretion of responsible professional

- 3) Immediately following pump shutoff, a recovery test shall be conducted, until well has recovered 90 percent of drawdown. Information shall be of sufficient detail to verify or improve data gathered during the original time-drawdown and constant drawdown phase of the test.
 - 4) The Hydrogeological Report shall specify proposed locations for wells to provide adequate amounts of water to meet standards imposed for fire protection.
 - 5) Present an accurate well test site location map, time drawdown and recovery curves, along with specific capacities, total depths, well driller's yield estimates, depth of casing and copies of actual well driller's logs.
 - 6) All information derived from the drilling and testing must be in the report, including all dry holes and wells dry after testing.
 - 7) The following minimum number of wells shall be developed and tested: Where the subdivision is less than 100 acres: 3 wells; where the subdivision is from 100-1,000 acres: 3 wells, plus one additional for each 100 acres or portion thereof in excess of 100 acres; where the subdivision is more than 1,000 acres: 12 wells, plus 3 additional for each 500 acres or portion thereof in excess of 1,000 acres.
 - 8) Well locations shall be as specified by the Director of Resources and Development, in consultation with the geologist. Generally, test locations will be selected to test the varying types of surface land and rock types evident in the subdivision. The Director may require additional wells at this selection stage if he deems it necessary in order to properly evaluate the subdivision.
 - 9) Additional wells, after the first selection, may be permitted by the Director to further test conditions in portions of the subdivision.
 - 10) Wells producing 2 gpm or less after a two-hour air test will be considered dry for purposes of establishing suitability.
- e) Community Well Testing Procedures

If a community type well is anticipated, the recommended aquifer test procedure will consist of four parts. It should be recognized that the procedures are guidelines, and will be flexible to fit the performance of the well. The objective of this process is to obtain as accurate information as

possible about the transmissivity and storage coefficient of the aquifer in the vicinity. The descriptions are as follows:

- 1) Development of well to degree necessary to perform aquifer test (responsibility of driller).
- 2) Step Drawdown Test

After the well has been developed, it may be necessary to perform a step drawdown test to determine the optimum flow for the aquifer test. If, during development, the professional responsible for aquifer testing feels he can give an adequate estimate of maximum well capability, the test may not be required.

Depending on well performance, the step test will consist of 3 or 4 stages. Due to well sounding requirements, it will be necessary to attach a sounding tube to the pump column. The tube will allow readings to be taken, unaffected by disturbances caused by pumpage.

Three types of data shall be gathered during step test: 1) time of soundings; 2) water level; and 3) discharge (gpm). During each step, the well will be pumped at a constant rate of flow, until drawdown becomes stabilized, or a straight-line relation of the time-drawdown curve plotted on a semi log scale is established. Then, the rate is increased, and the above-described procedure is repeated, until the well has been pumped at 3 or 4 rates.

- 3) Aquifer Test
 - a) The water level in the well should be observed for 24 hours prior to the test, to determine the initial depth to ground water. If the ground water prior to the test is not stable, observations should be used to adjust the actual test drawdown data to an approximate equilibrium condition for analysis. Pumping of any wells in the vicinity of the test well, which may influence the test results, should be regulated to discharge at a constant, uninterrupted rate prior to and during the complete tests, or until pump shutoff.
 - b) Any test wells drilled during the exploration of the site shall be preserved in such a manner that they may be used for observation wells to supplement the well testing procedures.
 - c) The measurements to be made, recorded and made part of the Report, for both the well being tested, and observation wells, shall include the following: static water levels prior to pumping, the rate of discharge from the pumped well, pumping levels or dynamic water levels, time of starting the pump, time of any change in discharge rate, time of stopping the pump and such other measurements responsible professional deems appropriate.

- d) The duration of the test shall be determined by the responsible professional, in consultation with the Resources and Development Department. Decisions about test duration shall be made on the basis of well performance.
- e) The test pump should be either a centrifugal, or more preferably, a turbine or submersible pump. It should be capable of lowering the water level to the bottom of the well being tested. The pump should preferably be powered with an electric motor, or with an engine capable of operating continuously for the duration of the test. The pump discharge line should be equipped with a valve and flow meter, so that the rate of discharge can be accurately controlled. At the beginning of the test, the valve should be partially closed, so that back pressure on the pump can be varied, as the test progresses to keep the rate of flow constant.
- f) During the aquifer parameter test, it is imperative that the water flow rate (Q) be constant.
- g) Lowering of the water level in the well will usually cause the pumping rate to decrease, unless the valve in the discharge line is opened to compensate for the additional head or lift created by the pump. If the pump is powered with a gas or diesel engine, changes in temperature and humidity of the air may affect the operation of the engine, and thus, cause variations in the pumping rate. Variations in line voltage may similarly affect the speed of electric motors, and thus, the pumping rate. Any appreciable variation in pumping rate should be recorded, and the cause of the variation noted.
- h) The flow from the test well must be conveyed away from the test site, so that recharge of the aquifer from water being pumped does not occur within the zone of influence of the test well, or any observation wells.
- i) Time Interval Recommendations for measurements listed in c) above.

Recommended time intervals for measurements in the pumped well:

<u>Time since Pumping</u>	<u>Time Intervals</u>
0-5 minutes	0.5 minutes
5-60 minutes	5 minutes
60-100 minutes	20 minutes
100 minutes-5 hours	30 minutes
5 hours-end of test	Discretion of responsible professional

Recommended time intervals for measurements in the pumped well:

<u>Time Since Pumping Started</u>	<u>Time Intervals</u>
0-2 minutes	Approx. 10 seconds
2-5 minutes	30 seconds
5-15 minutes	1 minute
15-100 minutes	10 minutes
100 minutes-5 hours	30 minutes
5 hours-end of test	Discretion of responsible professional

Recommendations are given only to emphasize the detail required for test purposes. It is recognized that final format for time intervals will be a function of the well performance.

- 4) Recovery test and report (report all wells drilled, including “dry” wells).
 - a) A recovery test shall be made at the conclusion of the pumping test, to provide a check of the pumping test results, and to verify recharge and aquifer boundary conditions assumed in analysis of the pumping test. When the pump is turned off, the recovery of the ground water levels should be observed in the same manner as when the pump was turned on, and continued until recover of 90 percent of drawdown.
 - b) The records to be included in the report, and that are required for analysis, and the tolerance in measurement generally considered acceptable, are as follows:
 - 1) Control-well discharge (± 10 percent).
 - 2) Depth to water in wells below measure point (± 0.01 feet)
 - 3) Distance from control well to each observation well (± 0.5 percent).
 - 4) Synchronous time (± 1 percent of time since control affected).
 - 5) Description of measuring points.
 - 6) Elevation of measuring points on observation wells (± 0.01 feet, relative to pumping well).
 - 7) Vertical distance between measuring point and land surface (± 0.1 feet).
 - 8) Total depths of all wells (± 1 percent).
 - 9) Depth and length of screened intervals of all wells (± 1 percent).
 - 10) Diameter, casing type, screen type and method of construction of all wells (nominal).

11) Location of all wells in plan, relative to land-survey net or by other acceptable method (accuracy dependent on individual need).

5) Additional Community Well Requirements

- a) Only wells with a yield of 10 gallons per minute or more will be considered sufficient for a community well. A well should not be aquifer tested unless there is a reasonable assurance that this flow requirement can be attained for long-term use.
- b) All season vehicular access to any community well must be designed, verified and included as a part of any community well testing project.

8. SEWAGE DISPOSAL REPORT:

a) Individual On-site System

If individual on-site sewage disposal systems are to be utilized:

- 1) The Sewage Disposal Report shall make specific recommendations, upon the type and size of systems that should be utilized, based upon the geological and soil information, including, but not limited to, the following:
 - a) Texture of the material into which the effluent is disposed by the leach field
 - b) Thickness of this material
 - c) Depth to ground water in the area
 - d) Hydraulic properties of the area
 - e) Bedrock configuration
 - f) Direction of surface runoff
 - g) Direction of subsurface flow
 - h) Proximity of other individual sewage disposal systems
 - i) Slope of the land
 - j) Proximity to road cuts and other possible areas of short circuit
 - k) Nearness to water bodies
 - l) Geologic environment, as related to neighboring properties
 - m) Interrelation of the disposal system in the hydrologic inventory

- 2) An analysis shall be made of the short-term and long-term effect of sewage or waste effluent on stability of the soil and underlying formation, and on possible contamination of the ground water.
 - 3) Systems recommended shall reflect all system design requirements of the Central Valley Regional Water Control Board, and the International Association of Plumbing and Mechanical Officials.
 - 4) If individual sewage disposal is proposed, each proposed parcel shall be shown to be able to have sufficient area for leaching that has an average percolation rate of less than 200 min/inch. No single percolation rate in leaching area may exceed 240 min/inch.
 - 5) There shall be an onsite inspection on the property and a subsequent conference with the applicant (or his representative) and his consultant prior to initiation of field work to prepare the sewage disposal report.
 - 6) If test or other well locations conflict with the proposed private sewage disposal system, the Report shall make appropriate recommendations for correction.
 - 7) The Sewage Disposal Report shall contain estimated minimum and maximum installation costs of any recommended private sewage systems. These costs shall be for the year the subdivision map is recorded.
- b) Public System

If a public sewage disposal system is to be used, the Report shall make a recommendation, upon the disposal of the effluent from the treatment facility, based upon the geological and soil analysis findings of the Report, and any recommendations shall be in accordance with the regulations enforced by the Central Valley Regional Water Quality Control Board.