APPENDIX F. SITE EVALUATION AND TESTING PROCEDURES

General

1. Percolation, groundwater and soils profile tests must be performed by those who are licensed within California as a registered civil engineer; a registered Environmental Health Specialist; a soils scientist; an Engineering Geologist; or other Qualified Professional approved by the Health Officer.
2. Results of all testing is to be submitted to Environmental Health (County EH) on the forms provided by the County or on an equivalent form.
3. A scaled site plan showing location of tests (appropriately numbered or designated to correspond to the test data) is to accompany the data.

Soil Profile Evaluation

1. Sites proposed for installation of new Onsite Wastewater Treatment Systems (OWTS) must be evaluated for soil conditions by excavating one or more soil profile test-pits with a backhoe or excavator. Soil profile evaluations are required in addition to soil percolation testing to determine the presence of restrictive layers or evidence of seasonal high groundwater conditions at and below the depth of the percolation test holes. The Health Officer may waive the requirement for backhoe test-pits and/or percolation testing for drainfield repairs, upgrades, or replacements where adequate soil information is available.
2. Soil profile excavations must extend at least 10 feet below the bottom of a proposed conventional leaching trench. Shallower excavations may be approved on a case-by-case basis or when an Enhanced Treatment (ET) systems is proposed.
3. Excavations must be made by backhoe or excavator capable of digging to a depth of 14 feet whenever possible. Auger or GeoProbe direct push is allowed only upon a case-by-case determination:
    a) when a site is inaccessible by backhoe,
    b) when necessary only to verify conditions expected on the basis of prior soils investigations,
    c) when done in connection with geologic investigations, or
    d) for septic repairs or upgrades when an ET system is proposed and it is not required that the soil or groundwater conditions 10’ below the depth of dispersal be evaluated.
4. Observations in the excavation are to be made for soil structure, the potential presence of seasonal groundwater, and the presence of restrictive, low permeability layers. Soils or formations containing continuous channels, cracks, or fractures are to be noted. Gleying, soil mottling, and soil moisture are also to be noted.

PERCOLATION TEST PROCEDURE

General Requirements

1. The minimum number of percolation test holes shall be 6 per site. Percolation test holes shall be distributed to provide a reasonable representation of conditions throughout the area proposed for the dispersal system. County EH may elect to witness the installation of the percolation holes, verify presoaking, and/or be present during all or part of the testing. The percolation testing shall be conducted in areas that meet all requirements for a dispersal system (i.e., slope gradients, setbacks, etc.).
2. Two (2) of the six (6) percolation test holes required shall be installed (developed) to depths of at approximately 3 feet (approximately means plus/minus 6 inches) below the proposed dispersal system depth. The remaining four (4) percolation test holes required shall be installed at the proposed depth of dispersal or within the range of the effective soil absorption sidewall (infiltration zone) depths. The resulting percolation rates from the two deeper test holes will be used to demonstrate that the deeper soils are sufficiently permeable (are faster than 120 Minutes Per Inch (MPI)) and whether the underlying soils have rapid perc rates (faster than 1-5 MPI) which may require an ET system. The results from these two test holes (min.) will not be included in the calculation of the overall percolation rate used to determine the required soil application rate for sizing of the proposed dispersal system.
3. All of the percolation test holes should be spaced 10 feet to 50 feet from each other and, no portion of the dispersal system should be proposed greater than 50 feet from the nearest percolation test hole.
4. When required by EH, soils expected to have a percolation rate slower than 60 MPI or having a high shrink-swell potential due to clay content (expansive soils) must be tested during the time period for winter water table observation.

Preparation of Percolation Test Holes

1. Percolation holes shall be prepared by hand auger whenever possible. A power auger may be acceptable on sites if approved in advance by Environmental Health.
2. Test holes are to be 4 to 6 inches in diameter and minimum 12 inches deep.
3. Remove any smeared soil surfaces from the sides of the hole by scraping with a sharp instrument.
4. Remove loose soils from the bottom of the hole and add 2 inches of clean pea gravel.
5. Insert a perforated or slotted 3-4” diameter pipe in the bore hole and carefully pack clean pea gravel in the annular space around the outside of the pipe.
6. Holes must be thoroughly presoaked prior to testing to compensate for any possible soil swelling. Completely refill each test hole with clear water 4 times or provide continuous soaking of the hole with clear water for 4 hours on the day prior or day of the testing.

7. Use only clear water and gently pour into the hole to prevent scouring of the sides and bottom.

Performing the Percolation Test

1. Adjust the water depth so that it is 6 inches over the gravel in the bottom of the hole.
2. From a fixed reference point (top of riser pipe), measure the height of the water surface every 30 minutes for a period of at least two (2) hours and until the rate of water level drop stabilizes and three (3) consecutive water level drop measurements are within 10% or 1/8 inch of each other. Refill the test hole to 6 inches over the gravel after every 30-minute reading until a "stabilized" rate has been achieved or a total of 8 readings have been obtained.
3. If, during the course of the testing, the water drains so rapidly that 30-minute readings are not feasible, switch to 10-minute readings. Refill the test hole to 6 inches above the gravel bottom and repeat the water level drop measurement procedures using a 10-minute interval instead of 30 minutes. Continue taking 10-minute readings for at least one hour and until the rate of water level drop stabilizes and three (3) consecutive measurements are within 10% or 1/8-inch of each other or a total of 8 readings are obtained.
4. If, during the course of the testing, the water drains so rapidly that 10-minute readings are not feasible, either: (a) reduce the interval further to 5 minutes or (b) measure the time it takes for the 6" water column to completely drain/percolate into the soil, and report that time as the resultant rate. Continue taking 5-minute readings for at least 30 minutes and until the rate of water level drop stabilizes over three consecutive readings or until a total of 8 readings are obtained.
5. All readings shall be reported in Minutes Per Inch (MPI). The final three readings shall be used to calculate the average "stabilized" rate <u>for each individual percolation test hole</u>. **Note:** When there is a pattern of significant variability in percolation rate at the end of the testing period, then additional testing may be required (e.g., extended testing, soil texture analyses, etc.).

Calculation and Interpretation of Percolation Test Results (Not for Seepage Pits)

1. The overall percolation rate to be used as a design basis for determining the sizing requirements of a proposed dispersal system is calculated by taking the sum of the individual stabilized results obtained <u>only</u> from the individual percolation test holes completed within the proposed effective infiltration zone and dividing this sum by the total number of perc test results from holes in this zone (minimum of 3 required). As noted in the previous section, the final three readings shall be averaged to determine the final stabilized rate for each individual test hole. The collection of these final (averaged) rates are then averaged together to calculate the <u>overall rate</u> to be used to size the proposed dispersal system and to determine the applicable groundwater separation requirements for the entire dispersal area tested. The resulting rates from

the deeper percolation test holes (approximately 3' below the proposed dispersal depth) shall not be included in this calculation. The deeper test holes will be used to 1) determine if the deeper soils are sufficiently permeable (are faster than 120 MPI) and 2) determine what type of OWTS will be required.

2. If the overall average percolation rate for the infiltrative zone is slower than 60 MPI, faster than 5 MPI in a nitrate concern area, or faster than 1 MPI outside a nitrate concern area, then the soil may not be suitable for a conventional OWTS. Additional testing in an alternate location or at different dispersal depths (infiltrative zone) may be conducted. Otherwise, an ET system needs to be explored.

3. The requirement for ET due to fast perking soils is a function of the perc rate in both the dispersal area and the underlying material. The definition of fast perking soil is faster than 5 MPI in a nitrate concern area and faster than 1 MPI outside a nitrate concern area.

   a. If the overall average percolation rate for the infiltrative zone is fast, the percolation rate of the soils tested at approximately 3' below the proposed dispersal depth will determine what type of system is required.
      i. If none of the individual stabilized percolation rates from the deeper test holes are fast, then ET will not be required due to percolation rates.
      ii. If any of the individual stabilized percolation rates from the deeper test holes are fast, then ET will be required due to percolation rates.
   b. If the percolation rates in soils tested at approximately 3' below the proposed dispersal depth are fast, but the overall average percolation rate obtained from test holes within the depths of the proposed infiltration zone is slower (and faster than 60 MPI), then the requirement for ET will depend on the soil profile/percolation rates between the two depths.

      Note: there are factors other than soil percolation rates (such as depth to groundwater or proximity to a stream or water body) that may dictate that an ET system is required regardless of soil percolation rates.

4. Percolation test holes developed in the proposed infiltration zone that result in "failing" rates that are excessively fast or slow (greater than 60 MPI), may be addressed by:

   a) Including the failing results(s) in the calculated overall average used to determine the dispersal system soil application rate and thus system sizing (this option is not available for a soil percolation test hole with <1 MPI), or

   b) Exclude the area represented by the failing test hole(s), and design and locate the dispersal area according to the resulting average of the other remaining test holes. To determine the area to exclude, split the difference between the failing test hole and nearest passing test hole to determine the radius of the area to be excluded around the failing test hole.

Additional percolation testing can be conducted to attempt to reduce the resulting average or to refine the exclusion area represented by the failed test result(s).

5. To complete a site evaluation which includes percolation tests, a report shall be submitted to County EH within one year of the date of the application. The field data for all percolation holes must be submitted. The report shall also include a copy of a scaled site map showing the location of the numbered percolation test holes relative to pertinent site features.

PERCOLATION TESTING FOR SEEPAGE PITS

Construction and Pre-Soak

1. Tests shall be in the primary and expansion area at the lowest elevation, or center if site is flat. If the pit field exceeds 50 feet across, there will be another pit percolation test for each area that is over 50 feet from the primary test area. The health officer shall approve the location and number of the tests.
2. Deep borings by a qualified professional may be used to determine the groundwater potential and soils structural and textural properties if located within 50 feet of the test pit area. The depth of the surface clay cap, common to areas using seepage pits, shall be identified.
3. Depth of the proposed seepage pit shall be determined to provide at least 10 feet of separation to the seasonal high groundwater elevations or impermeable layers. The health officer shall establish this level based upon relevant data provided from other studies, when recorded by a licensed geologist or geotechnical engineer. If the percolation test boring is used to establish groundwater, then the bottom 10 feet above the water must be backfilled and sealed with a bentonite mix.
4. Drilled borings must be a minimum of 4” and shall be constructed to the depth of the proposed pits.
5. After placing 4” of pea gravel in the bottom, insert a saw cut perforated pipe throughout the entire test boring to extend 6” above grade. If the pipe is almost as large as the boring, no gravel is required with enough perforations to allow water contact with all sides. If void space occurs in the annular space, fill with clean flowing coarse sand or pea gravel to prevent collapsing the bore hole.
6. Fill the test pipe with water enough to cover the entire effective flow area on the day prior to the percolation test. Record the depth to water and time of the initial filling. If during the pre-soak, the water level percolates down to half the wetted depth, within a 30-minute period on 2 consecutive attempts, then only a 2-hour pre-soak is required.
7. Recording methods for depths to water may include visual tape methods, float sticks with tape measures, “plunker-tape” soundings, or calibrated electronic devices. Recording methods must be accurate to within 1/8”

Method for Measuring Pit Percolation Rates

1. On the day of the test, measure the starting water depth and time prior to filling, resulting in a rate for the beginning and end of the pre-soak. Next, fill the test pipe with water to the proposed water inlet depth.
2. Record the falling head rate of fall at 30-minute intervals for 8 readings (4 hours). If rapid rates are occurring at 10-minute intervals or timed rate per inch intervals may be used for calculating percolation rates. Continue to monitor the rate of fall until a consistent rate is established.

Optional Method for Pits

1. If direct absorption rates are being calculated, refilling methods shall be used to maintain the consistent pressure head of a full pit. Soil Absorption methods will need to gauge total amounts of water added per boring surface area wetted, to establish gallons per square foot. Either method is effective and acceptable.
2. The application rates for the sidewall of the seepage pit shall be based on the Tier 1 Table (State Waterboard OWTS Policy) that provides application rate based upon percolation rates. If direct absorption is calculated by the engineer, then the results may be used to calculate the number and sizing of the pits. The rates of multiple test sites covering the pit field may be averaged in inches per hour, before conversion to an overall MPI.
3. Percolation reports shall be provided to the health officer on forms provided or acceptable for recording the field readings. Test locations and legends shall be indicated on the design plans.
4. Minor deviations can occur with percolation test. Depending on the circumstances, these may be considered by the Health Officer for approval.

GROUNDWATER AND SEASONAL WATER TABLE DETERMINATIONS

Background

The EH Land Use Program implements Santa Cruz County Code (SCCC) Sections 7.38.120.B and 7.38.150.B.9 when making determinations of compliance with regard to groundwater separation requirements for proposed onsite sewage disposal systems, including the use of ET systems with reduced groundwater separation. When required by the Health Officer, observation for seasonal high water table in the area of the proposed sewage disposal system must be made during the period of observation approved by the Health Officer.

Observation periods commence when cumulative rainfall during the rainy season reaches 60% of the seasonal average and is maintained as long as 6" of rainfall has occurred within the prior 30-day period. See the procedures for winter water table testing for more information.

Where is WWT Required?

For parcels lacking adequate data and/or when County EH doesn't have adequate knowledge or information about the area or when maps, files, or other sources indicate potential

seasonal high groundwater and/or prolonged near surface soil saturation, Winter Water Testing (WWT) will be required before County EH may proceed with permit application design review. Applicants or their representative are notified of the WWT requirement and are notified in writing when the WWT test period opens. Applicants may request WWT services as a separate Site Evaluation consultation where no sewage disposal permit application has been submitted. Alternatively, the applicant with a "full Site Evaluation" that may include the WWT services if the hours of service have not been exhausted. For all parcels requiring WWT, applicants must submit the completed Site Evaluation forms and fees according to the requirements outlined below.

Procedures

1. Sewage Disposal Proposals Requiring Winter Water Testing

   Sewage disposal proposals must include information on verifiable site soil conditions, duration of saturation of near surface soils (upper 4 feet) and groundwater information adequate to confirm that water table separation requirements are satisfied, and specific dispersal system will function properly. Site testing for groundwater will be required unless the system designer demonstrates to the satisfaction of Environmental Health staff that there is already adequate information regarding the location to determine that groundwater separation requirements can be met. The soil saturation depths must be approved by the County EH prior to installation.

2. Site Evaluation with WWT Service Request

   a. Early application, planning, site work, and preparation are strongly encouraged. All required site work, soils excavations, soils morphology determinations, groundwater piezometer installations and surface saturation port installations should be completed prior to the official WWT start date unless otherwise approved by EH. Locations for testing shall be identified and approved by County EH staff.

   b. Install the piezometers and near surface soil saturation ports before preparing and submitting the WWT Monitoring Plan.

   c. Submit "Site Evaluation" forms, site plans, WWT Monitoring Plans and fees by Jan 1, as set forth in SCCC Section 7.38.120.B unless otherwise approved by EH.

   d. WWT evaluations not submitted on time will cause the septic system application approval to be postponed until the subsequent winter testing periods.

   e. Submit a site plan after WWT testing is completed that clearly indicates the actual location of each piezometer, near surface soil saturation port, and all test-pit excavations.

3. WWT Monitoring Plan

   The WWT Monitoring Plan must minimally include the following elements:

   a. Detailed site plans with piezometer and near surface soil saturation test port locations and development logs (i.e. diameter or hole and pipe intervals/depths of sand, gravel,

bentonite, slotted pipe, etc.)

b. Proposed frequency and duration of monitoring

c. Description of observed test-hole soils profile characteristics:

Note: Soils morphology determinations must be performed by a Qualified Professional formally trained in soils science.

d. Description of near surface soil saturation duration testing methodologies

4. Piezometer Design

a. Piezometers must be installed and constructed in accordance with the above work plan; also see Figure 1 (attached sheet).

b. Piezometers must be constructed with 2” minimum to 4” maximum Schedule 40 PVC, ABS or NDS leach pipe (non-perforated) piping and shall be equipped with threaded end-caps or snugly fitted end-plugs that can be removed by hand.

c. Each piezometer shall be equipped with a minimum functional 1” wide x 12” deep (minimum) annular seal composed of bentonite, concrete or cement grout to prevent infiltration of surface and near surface water from channeling down the annular space of the borehole. Deeper annular seals may be necessary for accurate groundwater level measurements, based on soil conditions.

d. Piezometer casings must extend at least 6 inches above grade and must be slotted at the desired depth below the 12” minimum surface seal depth.

e. Clean gravel or approved sand must be placed to fill the annular space below the seal or as designed in County EH approved WWT Monitoring Plan.

f. Piezometers shall be labeled with permanent ink for identification purposes. A permanent reference mark, from which all water table measures are to be taken, must also be provided along the top edge of each piezometer riser.

g. At the end of the official WWT monitoring period each piezometer will be deconstructed and the remaining bore holes backfilled with clean native material.

5. Piezometer Siting & Installation

a. A minimum of 3 piezometers shall be installed across the area proposed for wastewater dispersal (this means a total of 3 piezometers needed for both the primary and expansion dispersal areas if located in close proximity). The siting must be approved by County EH prior to installation.

b. Additional piezometers may be required by County EH to obtain more accurate or comprehensive groundwater data.

c. An additional array of 3 WWT piezometers may be required if 100% leach field expansion area is not in close proximity.

d. One piezometer will be installed near each end of the proposed dispersal area (including top and bottom portions of sloped dispersal areas); a third piezometer shall be installed centrally within the designated dispersal area. The depth of the piezometer screen or slots shall be greater than: {proposed total trench depth} +2 feet + {groundwater separation requirement set forth in SCCC 7.38.150.B.9: 5' or 8', depending on perc rate and distance to a water body} or {proposed total trench depth} + 2', 3', or 5' if ET is specified. Ex. 2.5' proposed flow w/ 1.5' cover soil, therefore a 4' total trench depth +8' (if well is +250' feet away from septic system and soil is medium perc, 6-30 MPI) = 14 feet piezometer depth.

e. Additional piezometers will be required for depths above each restricting layer, if any are identified, as determined by soils morphology and County EH site observations.

f. WWT for ET and mound systems, where the standard separations are not possible, and groundwater is high must be discussed with County EH staff prior to finalizing of the WWT Monitoring Plan.

6. Near Surface Soil Saturation Testing.

a. In addition to testing for water table depth, additional data shall be obtained to verify that near surface soil saturation will not adversely affect function of the proposed dispersal system. Existing percolation test ports or new test ports can be used for near surface soil saturation duration determination. Existing perc test data and/or new test data may be used for near surface soil saturation testing as long as testing is extended over a time frame that verifies that water either moves through upper soils relatively rapidly (i.e. percolates faster than 30 minutes per inch) and/or does not remain perched over tight soils, in critical dispersal zones, for an extended period of time. Unless County EH determines that adequate information exists, the following testing for saturation will be required. A minimum of 3 near surface soil saturation ports shall be installed across the area proposed for wastewater dispersal (this means a total of 3 ports needed for both the primary and expansion dispersal areas if located in close proximity). Additional ports may be required by County EH to obtain more accurate or comprehensive surface saturation data.

b. An additional 3 WWT near surface soil saturation ports may be required if 100% leach field expansion area is not in close proximity. One near surface soil saturation port will be installed near each end of the proposed dispersal area (including top and bottom portions of sloped dispersal areas) a third port shall be installed centrally within the designated dispersal area. The depth of the ports shall be equal to the proposed total trench depth. Additional ports may be required, as determined by soils morphology and County EH site observations

7. Qualified Professionals Requirement for WWT

WWT data collection, analysis of results, and final reporting must be performed by an independent and currently licensed Qualified Professional (QP); including Registered

Environmental Health Specialists, Soil Scientists, Geotechnical Engineers, Registered Professional Geologists, Soils Engineers ("Soil Engineer" means a state of California Registered Civil Engineer whose field of expertise is soil mechanics), and Registered Civil Engineers. All the above Qualified Professionals must have specialized training/education in present day descriptions and interpretations of soils morphology.

8. Data Analysis & Interpretation

   a. The Qualified Professional shall present a WWT Final Report to County EH on behalf of the applicant wherein all required WWT information outlined above is compiled and results interpreted. The QP shall submit a professional opinion regarding the subject parcel's suitability for sewage disposal and present system design criteria based on site evaluation and WWT findings.

   b. The qualified Professional must report WWT findings to County EH within 90 days after the WWT period terminates, regardless of the final outcome of the study.

   c. Extremely heavy rainfall with high GW readings and near surface soil saturation which appear to be short- lived or brief inundation events should be recorded and reassessed 1-3 days after heavy rains, as set forth in SCCC Section 7.38.120.B. The highest persistent readings will be used as the acknowledged measured depth to seasonal high groundwater and/or near surface soil saturation for disposal system design and permitting purposes.

   d. County EH staff must be scheduled to observe at least one set of piezometer readings and two sets of near surface soil saturation readings (initial reading taken shortly after significant rain and the other showing the time length of near surface soil saturation duration) with the QP present during the WWT testing period.

Figure 1. CROSS SECTION OF TYPICAL GROUNDWATER PIEZOMETER