TO: MARK HUTCHINSON

ALBARROW C.A.S.C.
DEIR COMMENTS JAN 30 09

DEIR COMMENTS CASE AL BARROW

1. A-2: Supplemental Notice of Preparation and Comments/Responses
Need another SOP to evaluate new information not provided by SLO County for OPR.

2. Appendix B PD Data
Project data is flawed. The rough and fine screening assumptions upon which it is based are constructive fraud.
Professionals in the fields of Vacuum and LPS systems have consistently disagreed the SLO County Staff and the consultants have ignored this new information. The Airvac has repeatedly asked for a meeting with County staff and been denied. At a townhall meeting in November 2008 (available on DVD). Supervisor Patterson and Hill saw this new information as presented by the representatives who have many existing projects evidencing the viability of these less expensive and more protective technologies. The following are environmental impacts that are avoided by these technologies;

1. Vacuum: no INI (300K gpd for gravity) Reduced impacts more protective
2. Vacuum no leakage of sewage into the drinking water aquifer. CMOM show 5% to 8% leakage from gravity sewers Reduced impacts more protective. Attached studies show 16.5 to 49.1 percent exfiltration or leakage of raw sewage.

3. Vacuum no septic tank footprint on site, no electrical panel hookup onsite, no deep trenching avoiding those gravity impacts. Reduced impacts more protective
4. Vacuum can take advantage of gravity slope opportunity similar to gravity assist (a principle of vacuum engineering). Reduced impacts more protective
5. Low Pressure System: Vacuum no septic tank footprint on site.
6. HDD: Directional drilled to avoid bio, Cultural resources, existing infrastructure. Reduced impact more protective
7. No septage hauling/pumping can be installed in wet weather
8. Without industry input these USEPA approved systems have not been vetted adequately. Airvac and Eone and the like must submit reports on these technologies and their benefits along with existing projects. Why has this been ignored? The best project with least impacts should be part of this DEIR and the RFQ, which is not the case.
9. The environmental, economic, and community preferences information has been omitted by Carollo and SLO County staff as to alternatives. Vacuum and LPS need to be vetted here. As the more protective technologies. This new information must be evaluated according to CEQA. May 2007 Carollo said cost savings from alternatives vacuum and LPS will

be insignificant. They say otherwise in fact a savings of 50% is expected and huge environmental protection from INI and exfiltration

10. Attachment, Forward collection comparisons: Here is a 14 point discussion of Step vs Gravity pointing out the many foibles of Gravity. Please address these concerns. How can gravity be preferred in 3 of 4 projects? It is a bold lie. And you have no basis for this judgement simply because the other side of the discussion was not vetted. This is an engineer that has both Gravity and Step experience.

;

11. $21,900,000 attachment: If Reverse Osmosis is required due to grab violations at Broderson the trucking cost, mileage and pollution need to be identified. Have you got those details?
12. 2-40 bulletin 118 details show half of recharge was sewer leakage. And attachment 09-15-04-8ssr speaks to Petaluma WW system upgrade, which was done by Carollo a pond wetland in an area of high rainfall. They did not vet this or award winning 2008 Carnation WA in their screening. Sustainable and low energy solutions.
13. 600r01034 attachment: pg 4 show where leakage in gravity collection systems are found...almost all joints to manholes lateral, trunks and mains. They leak a lot, what is your plan to fix them at what cost? It's time to be honest and transparent.
14. ABAG attachment; this shows the loss of life and property in earthquake which is magnified by our liquefaction conditions. Please open it. The Northridge and the Loma Prieta quakes killed people and huge lost property recorded. If the bridges into town are damaged where will help come from? The South Bay Fire Department is our emergency services if that building collapses on the fore equipment, the com goes out or telephone service which is common in strong quakes what is your plan to recover? Broderson with its lamella underlay will cause liquefaction under the SBFD and the Redfield woods housing development. Many people would need assistance, fires may start from ruptured gas mains and sewer service would not be restored without repairs, When must the county have a recovery plan? When would it be studied for adequacy?
15. Biosolids Final Report, attachment: Not a popular proposal it is again in public review due by 2010. Project like ponds STEP that have no trucking for up to 40+ years are the Number one choice environmentally. The Cal Poly marine biology toxicology team has seen Nonylphenol disrupting the lifecycles of Goby and other MBNEP biology. It is a special status not allowed. Leakage of sewer effluent either from Broderson or collection system needs to be eliminated. Czmacd attachment: notes that federal funded project must comply with Coastal Zone Management law enforced by the CA Coastal Commission in permit applications. Leaking sewer in our potable water supply is not protective of coastal resource (water), and CZLUO attachment: Says protect archeo cultural resources, which gravity

sewers do not. These trenches are all on grid with exact slopes; unlike HDD small pipe installation they do not allow avoidance of graves and artifacts. How will you mitigate these impacts?

16. DHS DWSAP attachment: The rules for new source water require an application of 120 pages detailing the new water source. When will this be available and who will fill out this application? Sewer effluent will have a high bar for treatment. Potable water supply mixed with EDC and emerging contaminants that no wastewater treatment removes, may require RO. How many truckload of brine for a one million gallon plant? Where will brine be treated Ventura? At what cost $21 million a year? How much more water will be removed from our aquifer for this?
17. Soil Slippage attachment: Homes slide off of lots in liquefaction conditions as Berkeley reports. Damage to foundations, plumbing and wall how will the SLO County restore taxpayers/property owners for the losses caused by this foolish decision if such a quake should occur and the County has caused the liquefaction conditions? Lamella will cause the effluent to run under these homes and SBFD.
18. Before development of empty lots proof of water supply and an HCP with a mitigation bank is required by Ca Coastal commission. Why would a second assessment pass (part of the capital sewer cost $27 million) if we are in RMS Level 3? Why if there is no habitat mitigation bank taking is not allowed? Is the cart pulling the horse?
19. Assessment passed by threat of Notice of Violation from CCRWQCB up to $5,000.00 fines and loss of use of your property. Coercion or encouragement?
20. Initiative petition, attachment: SECTION 1. PURPOSE "The purpose of this initiative measure is to establish standards and procedures for the location of sewer and wastewater treatment facilities to be constructed by the Los Osos Community Services District (the "District") both within and outside the District boundaries that would serve and be paid for by the people of the District. Such standards would serve to protect the people and the environment, including the groundwater, from health and environmental damage that may result from improper siting of such facilities." TRI W is slated for a lift station...that has to be put to a vote according to Measure B. Have you considered the gravity collection in that light? What impact might that have on the project.

Monowitz CCC permit, Attachment; the attorneys show that false or misleading information is grounds for denial of Coastal Development Permit.

Grounds for revocation of a permit shall be:

- Intentional inclusion of inaccurate, erroneous or incomplete information in connection with a coastal development permit application, where the commission finds that accurate and complete information would have caused the commission to require

additional or different conditions on a permit or deny an application.[1]

Stated differently, all that the Commission must find to revoke the Permit is (1) the Commission was presented with incomplete, inaccurate or erroneous information; (2) the inclusion of this information was intentional; and (3) complete or accurate information would have caused the Commission to have issued at least one condition in a different manner, or have denied the application.

- 2. The Incomplete Or Incorrect Information Need Only Have Related To The Permit Application.

B. The Information Must Have Been Intentionally Included.

The second prong is that the information was intentionally included.

1. 1. There Is No Required Showing Of Bad Faith.
2. 2. The Best Means To Determine Whether Information Was Intentionally Included Is To Determine How Often the Statements Were Made.

The County consultant Carollo has repeatedly stated unsupportable fact regarding costs and claims of the best most protective technology and that they all cost the same. How will you refute that?

21. Pipe Slopes 2 Attachment: Many pipe slopes in the MWH collection design are inadequate for 2' per second scouring speeds using the Manning formula. What will you do to make them functional? Vacuum truck daily pumping? The same slopes caused the Nipomo manholes to degrade by hydrogen sulfide and were replaced or repaired please give us the cost of R&R of decayed manholes due to inadequate slopes. To force fit gravity collection in this hilly environment the grade from South Bay to the Bay was designed at .05 or less many miles under the SLO County standards for gravity slopes. (Standard Improvement Specifications and drawings) section 11-351.1611. 100 gallons per person is the flow with double peak flow, minimum velocity of 2 foot per second minimum flow. Please explain how this will be achieved, as the stated flows in the Carollo reports are less than 70 gpp. Please account for the diurnal flows (morning and evening). The design flow and the gradient seem a challenge to meet in hilly Los Osos/Baywood Park. A 1/8 of an inch slope is a conservative and standard for gravity collection. Why not err on the side of caution rather than end up like Nipomo with replacement and vacuum sewer costs? These problems do not exist in STEP and LPS collections and to far lesser degree in Vacuum collection. So why chose the antiquated technology best suited for flatter conditions? Design flows are minimal for a community that has to conserve water reducing flows, why? Isn't this a design to fail?

(D) The minimum gradient for 8-inch sewers
should be no less than 0.4 percent
Regardless of pipe material.
(E) The minimum gradient for 6 inch sewers

---

[1] Section 13105(b) provides the alternate ground for revocation of a permit: "Failure to comply with the notice provisions of Section 13054, where the views of the person(s) not notified were not otherwise made known to the commission and could have caused the commission to require additional or different conditions on a permit or deny an application."

should be no less than 0.6 percent, preferably 0.75 percent.

21. Re: Comments on fine screening, Attachment:
· Sewer plant O & M costs should be pegged through the life cycle of the loan period to the rate of energy related inflation. Will that be done?
· The sewer best option should be chosen by energy analysis. No detailed energy analysis has been done. I am really surprised at the lack of information and it's omissions. When will that be done?
· The simple mention of existing power rates in a graph has nothing to do with sustainability analysis and puts the whole project in jeopardy. Will you correct that?

· Energy availability will be a problem because of the10 to 30 percent hydroelectric related snow pack reduction and increases in peak energy demand due to Global Warming caused by higher summer temperatures. Will you take that into consideration? How?
· Loss of annual snow pack means reservoirs will have to shed winter overflow that was previously used to create spring and summer power.
· Blackout and brownouts may be the norm when this sewer plant comes on line in 2011.
· Lifting water to Broderson to achieve a 20% groundwater recharge is a fatal flaw. One it won't reach 20% and two it will pollute potable water. For every gallon recharged, five gallons have to be lifted to the sight at unknown energy costs.
· Aggressive on site greywater retrofit program would use zero energy and help clean the upper aquifer immediately. Will you consider that in calculating future water flows lower? As with Ag. Watering, there would be 'no discharge' if delivered to the root zones of home landscaping. Why not consider that?
· Conservation is the most energy efficient method for offsetting overdraft. It is not addressed adequately, When will you address that?
Comment:
The most accurate assessments of energy availability make the whole sewer project unsustainable and
contrary to good planning practices. Graphs courtesy of the Dynamic Cities Project, show a depletion
model for the United States.
Urban planning for peak oil and natural gas depletion is essential. The present sewer projects in the fine
screening would be severely impacted by any energy emergency above a class 2 emergency described
above. How ill you address this?
Final Comment:
The Fine screening is incomplete related to GHG issues, energy scenarios, sea level issues, and salt
water intrusion issues driven by sea level rise. Improving the environment is a holistic action. GHG

pollution is important for generations to come. Nitrogen mitigation that drove the original need for a
centralized project seems to have been forgotten as a goal. Consideration of the total water cycle has
been driven off course by an uncooperative Water board that has lost is way with environmental water
stewardship. The sewer project refuses to face sustainability issues that are mandated by the very same
state water agency in Sacramento that the RWQCB3 answers to.
· State GHG goals are being totally ignored in this study.
· Energy costs per ML nitrogen removed totally ignored in this study.
· Sea Level rise is being totally ignored by this study.
· Global warming impacts on energy are totally ignored.
· Nitrogen sequestering and recycling is totally ignored.
· On site and scaled cluster systems are not compared for energy efficency and omitted as viable while
considered elsewhere.
· Alternative energy is not proposed for operations.
· Sustainability's relationship to affordability and environmental justice is misunderstood and ignored.
· Co-generation is not proposed or studied although being used elsewhere in the State.
In defense of my position I would say that building a 1960's energy and resource consumptive community
sewer driven by market forces related to known engineering relationships and 'mega-project' construction
standards drives this study. Energy efficiency, global warming and GHG issues are left off the table.
Citizens should accept no excuse for their omission. – Steve Paige June 5, 2007
How will you address these concerns?

22. 6 Table 1.1 needs to name the facultative ponds still in after fine screening. Is ADS, AIPS or Nelson
in?
7 1.2.1 Seawater intrusion reversal can be accomplished outside of the project by reducing the lower
aquifer draft in lieu of upper aquifer water with nitrate for residential landscape application. These
expenses can be paid by new development starting with the schools and park. Purple pipe is
encouraged and funded by DWR. See the 2003 white paper on reuse. (Our upper aquifer is
replenished by septic effluent and classed as partial wastewater or we would not need a sewer.
8 1.2.2 Golden State has applied to CAPUC for rate increase to pay for infrastructure and treatment

that will utilize the upper aquifer. How many ACY will that reduce the lower draft? This is an omission
that needs attention.
9 1.3 Flow projections will not change constituent treatment requirements, with ponds it is not a big
factor as with 24 hour in 24 out treatment train but that will effect disposal numbers.
10 FATAL FLAW "Properly installed bell-and-spigot..." will leak raw sewage into our drinking water
aquifer which will soon be the upper aquifer as the lower aquifer is not recharging.
11 2.1 KEEP THE WATERS IN THE BASIN unless the water is not needed then it can be sprayed and
disposed.
12 2.1.2 Lower aquifer is intruded and that portion is lost That is not necessarily so.
13 Upper aquifer water must be harvested to the point it does not leak into the bay.
14 Recharge must not have Phosphorus, which will clog soil pores. All treatments so far do not address
this.] impact on reuse. Calcium treatment that is affordable can be used in combination with wetlands
to remove phosphorus this so the treated effluent waters are safe.
15 2.3.2 Bullet 4 describes the cost per acre of grade II-III farmland as $40, 000.00 I think $10,000.00 is
a more responsible number. Giacomozzi was $323,000.00 for 35 acres at one point. More inflated
costs!
16 The case is correctly made that pumping the upper aquifer as landscape water is cheaper than
piping effluent back to town and much safer.
17 Table 2.1 page 33
18 PERCOLATION PONDS AT BRODERSON: This was a project FATAL FLAW in 1997 SLO County
plan
19 Urban wastewater reuse is a poor concept compared to upper zone nitrogen water for irrigation
instead of drinking water. Less piping and much lower health risk on school and community center.
20 They represent over 40ACF reduction in saltwater intrusion on the school/park sites.
21 2.1.2 Sea water intrusion is not irreversible. Early-indicator signals of groundwater contamination: the
case of seawater encroachment
22 FCGMA documents reversal of saltwater intrusion in Ventura County.
http://publicworks.countyofventura.org/fcgma/GMA%20Management%20Plan-

Final%20051506x%20electronic%20v2.pdf see page 25 for reversal of saltwater intrusion. Grants
from 319 USA were used, see page 75 reduction in seawater intrusion.
23 I recommend a cost benefit analysis for purple pipe in the reuse portion. And a note on septic INI if a
tank can be retrofitted in ground with sprayed epoxy, like manhole restoration it would only cost
$700.00 per tank. saving replacement and removal and retirement costs Replacements could take
place at the point of resale so as not to have the community dug up at once. Charlotte County did not
replace any tanks. For Gordon's benefit they used a Tarriff document to gain access to private
property i have a copy if you would like me to send it along. Tank need certification as per RWQCB3
requirements. If a tank is abandone it could be used to capture rain water and recharge through
existing leech fields. (No waste)
24 The STEP collection works well with pond treatment with low biosolids production and lowest energy
demand making the combination the most sustainable as the project goals state Many constraints
and costs have been added to STEP by this document that are not supported by the STEP Industry
data. I have screened out gravity due to the eventual leakage into the drinking water aquifer as they
have admitted. One other FATAL FLAW is the seawater intrusion around the Bay where the deepest
pipes will be trenched in. When saltwater enters the collection system then the treatment plant will
require reverse osmosis and brine trucking to Ventura County will ensue as many as 60 trucks a day. The expense of these impacts was not added to the gravity cost as I recall $60,000.00 a day or

23. Re;Revocation of Coastal, Attachment: Revocastion of Coastal Development Permit Application No. A-3-SLO-03-113

Dear Commissioners, Peter Douglas, and Staff;

C.A.S.E. is represented by Burke, Williams & Sorensen, LLP. I say that so you will understand the gravity of our concern.

1. The misleading and completely false information in the LOCSD/MWH sewer Project

Report led you to believe, incorrectly, that the proposed sewer was somehow located in the only place appropriate for Los Osos i.e. the Tri-W property on ESHA, upslope of the Morro Bay estuary. Raw sewage plant of this genre is responsible yearly for over 6,000 coastal spills a year. The risk of a plant upslope of the Bay is not acceptable when an environmentally preferred site is still presently available.

2. Wetland impacts have been taken lightly by the LOCSD. For example 4th and Pismo, a rout for sewer mains, has 20 foot tall willows and oaks growing halfway to 5th St upslope where a spring originates feeding the wetlands below all the way to the Bay a distance of several blocks. USF&WS have relied on LOCSD environmental consultant Crawford Multari & Clark to provide true and accurate information on wetland impacts. Th e District has 9 employees with truck that service and check the 3rd street pump station two blocks away. The willows described at the edge of the bay from the El Moro drainpipe to Sweet Springs preserve grow along the eastern side of the Bay. Such an omission could not be construed an oversight, but seem an unwillingness to redesign the collection system in that area.
3. There has been no study on the impact to that spring and it feeding of the wetland bio. The Coastal Act protects such wetlands. Routing a collection system that will require maintenance and repair through sensitive areas is improper and a FULL hearing is required, We have seen staff to staff advice between Mr. Monowitz and LOCSD General Manager Bruce Buel over the appeal process fail to address these issues by micro managing the project. That is why this method of oversight is inappropriate under Coastal Act Rules.
4. The preferred environmentally protective method in the Final EIR, STEP collection will avoid these issue. It was "too expensive" to use according to table 4-4 of the LOCSD Project Report. That was a lie. I am attaching a present cost of the environmentally preferred STEP collection and treatment plant on the preferred location in grade 3 AG land.
5. The "On Balance" argument used for this sewer location is a flat out lie. This LOCSD sewer in not more protective of the Coastal Resources. It wastes our water. It destroys wetlands. It is 10 times the National average in cost. It unnecessarily destroy ESHA in the sacred "Green Belt" where ESHA is contiguous. It may require 40 acres be negatively impacted by leech field failure as not effluent perc test have been applied to the drain filed areas.
6. The recovery plan in the Draft HCP has omitted the replanting with viable plants rather than seeds. And the likelihood of the HCP to address the perpetuity of the endangered species is very questionable. The Coastal Act/LCP require your commission CERTIFY these documents BEFORE a coastal development permit is issued.

I respectfully request you withdraw the Coastal Development Permit for this project until the Habitat Conservation Plan is certified. At present it is going to SLO County for beginning public circulation and comment. The affected public here has yet had comment on this HCP or the final EIR/EIS from USFWS. Your cart should be behind your horse.

I respectfully request you Revoke the LOCSD CDP due to the project designs are incomplete. You may be aware that the Design Engineering firm has left out concrete and other amenities essential to build the proposed plant. The cost estimate was close to 50% in error. Only 3 of many qualified contractors bid the project showing there is a lot of risk tied to this project.

The gravity collection design listed on the the DEIR SLO County web site is the one referred to above. That permit was cancelled by LOCSD. How will the concerns listed and answer how they will be mitigated, changed or addressed?

24. Sewer Paper attachment:
The NRDC published some concerns in the paper "SWIMMING IN SEWAGE" How will you address these environmental concern created by Gravity sewers? • Endocrine toxicity;
• Gastrointestinal/liver toxicity;
• Immunotoxicity;
• Respiratory toxicity; and
• Skin or sense organ toxicity.
Bioaccumulative toxin that will store in fat tissues and all the risk associated with sewer effluent in potable aquifers well documented need to be avoided. How will you do that?

Draft EIR available will enable Los Osos community residents, the project team and County elected
officials to consider the LOWWP's potential environmental impacts as the County identifies the
County of San Luis Obispo
Alternatives to the Proposed Project Los Osos Wastewater Project Draft EIR
7-6 Michael Brandman Associates
H:\Client (PN-JN)\0224\02240002\DEIR\1 Sections\02240002_DEIR Sec07-00 Alternatives.doc
Preferred alternative using environmental, economic, and community preferences information;
incorporates appropriate mitigations; and moves forward with the final design and permitting process.

1. The environmental, economic, and community preferences information has been omitted by Carollo and SLO County staff as to alternatives.

Vacuum and LPS need to be vetted here. As the more protective technologies. This new information must be evaluated according to CEQA.

3. Appendix C Land Use

The Williamson act as related to prime ag land at Tonini is not addressed. Giacommazi has grade 3 grazing lands primarily. The impacts are quite different. Less piping for Giacommazzi.

4. Appendix D Groundwater

Recharge at Broderson is not evaluated for the impacts of the Lamellae fine lenses as they will move effluent laterally more than stated. Seawater mitigation will not happen. Water will surface down slope to destabilize housing development Redfield Woods as liquefaction conditions are caused by effluent lateral movement underneath the foundations. These home cannot get earthquake insurance. Please re evaluate. 300K gpd lost to INI in gravity collection. Please evaluate and mitigate these significant impacts. There are cumulative impacts here.

Recharge at Broderson will likely call for RO and Advanced Oxidation. Reverse osmosis membrane will reject over 30% brine that will be hauled to Venture brine receiving facility or elsewhere. Please address this missing information as complying with CA DHS Recharge regulations apply for Broderson if sewer effluent is used.

Over 60 truck loads a day at 5K gallons (42,500 pounds per truck). The air pollution is not quantified for pounds of diesel emissions.

The footprint of such treatment is not described. Please include.

5. Appendix E Drainage

NC

6. Appendix F Geology

Morro Bay gravity collection pipes were so damaged in the Dec 22, 2003 earthquake FEMA grants were awarded...In Los Osos where the water pipes were not damaged as in MB the septic tank remained intact as well. But the SLO County engineering put a penalty on STEP but not on gravity collection more bias based on not science.

The 1994 Northridge earthquake is well documented for damage to gravity collection (14years and $2 billion to repair) pipes but water pipes were much easier and quicker to repair over 60 of water was restored in 24 hours. Similar to STEP, LPS and Vacuum collections.

4.6 GROUND LURCHING The October 17, 1989 Loma Prieta earthquake was responsible for 62 deaths and 3,757 injuries. In addition, over $6 billion in damage was reported including damage to 18,306 houses and 2,575 businesses. Approximately 12,053 persons were displaced. The most intense damage was confined to areas where buildings and other structures where situated on top of loosely consolidated, water saturated soils. Loosely consolidated soils tend to amplify shaking and increase structural damage. Water saturated soils compound the problem due to their susceptibility to liquefaction and corresponding loss of bearing strength.

Ground lurching occurs as the ground is accelerated during a seismic event. As evidenced by the Loma Prieta, Landers, Northridge, and San Simeon earthquakes, the effects;

The October 17, 1989 Loma Prieta earthquake was responsible for 62 deaths and 3,757 injuries. In addition, over $6 billion in damage was reported including damage to 18,306 houses and 2,575 businesses. Approximately 12,053 persons were displaced. The most intense damage was confined to areas where buildings and other structures where situated on top of loosely consolidated, water saturated soils. Loosely consolidated soils tend to amplify shaking and increase structural damage. Water saturated soils compound the problem due to their susceptibility to liquefaction and corresponding loss of bearing strength. See http://www.es.ucsc.edu/~es10/fieldtripEarthQ/Damage1.html

Ground lurching can damage facilities and buried pipelines. Ground lurching occurs due to
detachment of underlying stratigraphic units, allowing near-surface soil to move differentially
from underlying soil. The site is within a seismically active region of Central California that is
prone to moderate to large earthquakes. It is therefore our opinion that there is a potential for
ground lurching to impact the site. Ground lurching is generally not a geologic hazard that can

be prevented, and therefore is mitigated by implementing preparedness measures. That is why lamellae is a new liquefaction condition not addressed. That changes the impact levels and the mitigation therefore is an unaddressed significant impact.

The fault search routine in FRISKSP was used to identify active and potentially active mapped faults and fault segments within a 62-mile radius of the project vicinity They include: Los Osos, Hosgri, San Luis Range (S. Margin), Rinconada, Casmalia (Orcut Frontal Fault), Lions Head, San Juan, San
Adreas (Cholame), and Los Alamos

5.4.5 - Level of Significance Prior to Mitigation
Less Than Significant or No Impacts were found related to the project being susceptible to fault
rupture and landslides. These issues will not be discussed further.

- Hokie and unscientific assumption in light of exisiting evidence that Los Osos has a 7.5 Hosgri fault 10 miles offshore 7 magnitudes higher than the San Simeon 2003 quake. The complete analysis and with the lamellae lenses this is inadequate. People will die, buildings will be destroyed if Broderson is implemented.
- The gravity trenching will cut through he clay lenses causing the waters to run down the trenches to the bay. A matrix of 8' deep trenches will make a creek that will drain these perched water bowls (clay lenses) out to the bay where we will lose a large mount of waters. When a quake occurs the wet soils in the trenches will consolidate and the engineered slope of the beds will be lost. The gravity sewer will cease to function as designed and Los Osos will be without sanitary services and at risk of cholera and other contagious diseases. How will services be provided? At what cost? Please detail the recovery plan as case law has adjudicated.

rationale for determining a Less Than Significant or No Impact for each of the thresholds of
significance can be found in Appendix F-1. Table 5.4-1 is a summary of Geology Significance
Determination and provides a quick reference for items of No Impact, Less Than Significant Impact,
and Potentially Significant Impact (for which mitigation measures are proposed).

Project-Specific Analysis
Proposed Project 1
Strong seismic ground shaking can occur in response to local or regional earthquakes. The sites
under Proposed Project 1 are located within a seismically active area, and the potential exists for
strong ground motion to affect the proposed facilities at the sites under Proposed Project 1 during the
design lifetime. In general, the primary effects will be those phenomena associated with shaking
and/or ground acceleration. Given that it is likely for the proposed facilities to be impacted

Cumulative Impact Analysis
Proposed Project 1
Implementation of Proposed Project 1 may contribute to cumulative ground shaking impacts on
people and/or structures. Therefore, Proposed Project 1 may contribute to cumulative fault rupture
impacts; and this contribution is considered cumulatively considerable, therefore, significant.
Not correct as mitigation is called for but not detailed. It could be inadequate without seeing it. Kabuki. I am reading this with a tinfoil hat on.

5.4.7 - Level of Significance After Mitigation
Project-Specific
Proposed Projects 1 Through 4
Less than significant.
Cumulative Again Not correct as a mitigation is called for but not detailed. It could be inadequate without seeing it. Kabuki. I am reading this with a tinfoil hat on.

Proposed Projects 1 Through 4
Less than significant. Not correct as a mitigation is called for but not detailed. It could be inadequate without seeing it. Kabuki. I am reading this with a tinfoil hat on.

7. Appendix G Biological

See California Native Plant Society responses which are significant and note that Native that are damaged by diesel will be invaded by nonnative like South African Veldt grass, thereby losing the mitigation for TRI-W and the excavation of the Broderson leach field will also be invaded by non natives or exposed to it. How will you mitigate those impacts?

8. Appendix H Cultural

Deep trenching of gravity collection will disturb cultural resources. Where there is an alternative of lesser impact that should be selected. See CZLOU and Coastal Act and Estero Plan which all require least impactive project to goals and guidelines.

9. Appendix I Public Hearing

10. Appendix J Traffic

21,900 brine trucks
Union Asphalt quantified the truck hours to move 2,500 trucks of river rock for leach fields at Broderson. From their Santa Maria Site; 228,690 mile, $1,262,869.05 materials, $734,349.00 trucking cost, 90 miles round trip. 170 minutes a trip at 20 yards of rock per load and each truck will weigh 80,000 pounds. A yard weighs 1.2 tons or 2400 lbs. Times 20=48,000 lbs. How much diesel fuels for all of this hauling please state the facts, the impacts and the mitigation.

Please evaluate road impacts/damage and traffic flows. Why this obvious concern is not addressed is curious.

Similarly evaluate 3,750 truck loads of sandy soils to be removed from Broderson leach field and where it will be taken. If fill for what site? (leach field is 8 acres assuming 7 acres of leach area 6 feet deep with 4 feet of rock and 2 feet of other cover.)
Untitled 3 attachment: Shows utility pipes crossing gravity trench have to be cut, capped and replaced loss of service time needs to be identified for those properties. Have you evaluated this impact?

11. Appendix K Air Quality
All trucking mentioned above has AQ impacts. Will truck retrofits, as described by recent air quality legislation since this document was written, be implemented? That will increase the economics of this aspect of the project. Please re evaluates.

12. Appendix L Noise created by Brodeson truck and RO trucking need quantifying, What will those potential impacts be to humans, plants and animals?

13. Appendix M Agriculture
AG lost from Tonini is a greater impact than Giacomazzi grade three grazing land that is hard pan clay in the summer and expansive in the wet season. What will you do to reduce those impacts or mitigate them?

14. Appendix N Visual Resources

15. Appendix O Environmental Justice
8.3 - EFFECTS FOUND NOT TO BE SIGNIFICANT
The environmental issues that were determined not to be significantly affected by the proposed
Project and therefore, do not require evaluation in the document, per section 15063(c) of the State
CEQA Guidelines, are as follows:
□Mineral Resources
□Population and Housing (Displacement of Substantial Numbers of Existing Housing and
People)
□Public Services and Utilities (Fire and Police Protection, Schools, Parks, Solid Waste, and
Other Public Facilities
□Recreation
The above environmental issues were determined not to be significantly affected by the proposed
project in the Notice of Preparation (NOP) for this Draft EIR (Appendix A), and in the Draft EIR for

the Los Osos CSD Wastewater Facilities Project (November 2000). The NOP, 2000 EIR, and the
following discussion are intended to provide adequate environmental documentation for the issues
that will not be further addressed in the EIR.
So the impact of losing your housing does not count?
When renters lose their housing due to proposed $250.00 a month cost of this sewer as defined by SLO County. Many can barely make the rent payments. That is not an impact of this sewer. When senior lose their homes, that is not an impact? When marginal population become refugees that is not considered a project impact?
Please read Sierra Club sustainability policy for affordable housing stock:
"Affordable Housing Crisis Plagues America
More Americans than ever before live in inadequate housing or spend more than half of their monthly income on housing. As the growing population's demand for housing increases, we are failing to provide affordable, convenient options. Strip malls and cookie cutter housing developments do not represent the needs or wishes of most Americans. Suburban sprawl and limited transportation choices often fail to provide affordable housing. Even middle income Americans are feeling the affordable housing crunch as new home prices escalate.
Sprawl pulls investment and the tax base away from existing communities, and forces the expensive construction of new roads, sewer lines and other infrastructure. Smart Growth provides a solution to sprawl and the affordable housing challenge. Fighting sprawl can and should include Smart Growth and affordable housing." See http://motherlode.sierraclub.org/challenge_sprawl.html

Gentrification: An Unnecessary Evil
Many residents of inner cities fear revitalization projects. If their community becomes a more desirable place to live because of improved services, accessible jobs, and business opportunities, won't housing prices rise? To prevent gentrification-the displacement of current residents by more affluent newcomers--community members can create a development plan that incorporates exclusionary zoning, fair-share housing, and rent controls to keep housing affordable. Replacement ordinances make sure affordable housing is not lost in the construction of better communities. Giving all citizens a voice in planning is the key to Smart Growth. Revitalization does not need to drive out low-income residents. And:

http://www.lhc.ca.gov/lhcdir/house/FrankJun01.pdf

The impacts of this project will be to reduce the affordable housing stock. Under General Plan, CZLOU and Estero Plan policies and principles that is an impact. Again case law supports protecting coastal resources for affordable housing. See CA Coastal Commission laws and Policies. And Ca Housing Policies and statutes. A project in conflict, where there is a project alternative of a lesser

impact should be selected. No where in the body of water law or state law does it state a community must implement the most costly alternative. In fact the opposite is true.

Fair Share housing to promote neighborhoods, create a vibrant,

Diverse community, and meet the needs of a variety of income levels... This project does not allow our diverse community, but forced gentrification. Our work force will need to commute causing more traffic impacts with these added costs

http://www.sierraclub.org/sprawl/affordable.pdf

16. Appendix P Alternative information
Constructed Wetlands: Effluent disposal using constructed wetlands would create habitat as
Well as recreational and aesthetic benefits for the community. Wetlands are considered primarily
As a storage device. However, disposal through evapotranspiration could also occur.
Constructed wetlands typically operate at depths of 1 to 5 feet, and areas of both vegetation and open water allow for different types of habitat.
http://www.npr.org/templates/story/story.php?storyId=90043021
Yes and it remove the human carbon that causes disinfectant by products. Metals and emerging contaminant
sustainably. Polishing the water for AG reuse and exchange. At a low energy cost. See Clayton County Ga

"I like to say it's raining everyday in Clayton County because we're putting right now about 10 million gallons back in our water supply," says Mike Thomas, general manager of the Clayton County Water Authority.

Thomas says the reservoirs here are full and have never been in danger of being too low. That's because back in the 1980s, folks realized there wasn't enough water to support the growth, so they decided to build a system of wetlands and reservoirs that would help them save water. And... The price tag is also an advantage — it can be as little as half the cost of building a regular wastewater treatment plant.

This idea probably won't work for bigger cities like Atlanta because it requires a lot of land. Still, it's attractive for smaller communities.

And there's an added benefit: Officials can create a nature preserve for those who live nearby.

Table 1: Summary of Evaluation Criteria

Baseline Criteria	Sub-criteria	Comments
1. Water Balance	A. Salinity Management	Project must contribute to mitigation of saltwater intrusion into lower aquifer Due to lamellae lenses the effluent will not reach the lower aquifer and no seawater mitigation will occur. Project goal not met.
	B. Groundwater Recharge	Project must contribute to recharging groundwater resources in lower aquifer Again: Due to lamellae lenses the effluent will not reach the lower aquifer and no seawater mitigation will occur. Project goal not met.
2. Water Quality	A. Meeting RWQCB Requirements for WDR (Discharge limits)	Project must be effective in meeting effluent discharge levels for: BOD, total suspended solids (TSS), nitrogen, viruses, and bacteria.
	B. Meeting RWQCB requirements for elimination of pollution to groundwater	Project must involve mitigation of potential effects of effluent discharge on domestic water wells.
	C. Addressing emerging contaminants: pharmaceutical and other constituents	Project is required to be consistent with EPA standards for emerging Contaminants

Project fails to meet this goal. RO and Advanced Oxidation required, not included in project description.
3. Energy The project is a higher energy user...not sustainable. See ponds and wetlands and AG exchange data in Ripley Project Report 2006.
A. Contributing to
Improvements in air
quality
Project must demonstrate:
• Minimizing particulate emissions
As stated above in Traffic and AQ the trucks trips necessary for Broderson and RO brine hauling will have significantly greater impacts than Ag exchange in Lieu of pumping where RO and trucking 3,700 truck of dirt are not required.
• Effectiveness in minimizing release

Baseline Criteria Sub-criteria Comments
of airborne pathogens, and exposure
to vectors
Any septage hauling will cause spores to be air borne See SWRCB fines of the Pacifica Plant.
B. Promoting
sustainability
Project must increase energy efficiency
over conventional designs, reducing
overall use of natural resources
C. Reducing greenhouse
gas emissions
Project must result in reduction of
carbon footprint from conventional
designs Carbon footprint big with gravity construction. Fused pipe under estimated
4. Costs A. Life Cycle Costs Project must involve:
• Efficient use of funds for capital
improvements
• Lowest feasible and practical
Operations and maintenance costs
Necessary to meet WDR discharge
Limits.
Gravity sewers have a long history of violations; Here is a plant designed by MWH the designer of the 3 gravity projects you have listed as project 2,3 and 4.

Lila Tang of the San Francisco Bay Regional Water Quality Control Board said her agency would investigate the January spills in Pacifica.

"We have taken quite a few enforcement actions against the city (over time), possibly more action than against other cities," Tang said. "We haven't imposed

any corrective actions on them for the January incidents or for these types of wet-weather events in general," she added, noting that the city of Burlingame ended up discharging more than 2 million gallons of fully treated wastewater into the Bay during the same weekend.

Tang said the Pacifica plant could escape a fine if it had no alternative than to dump the wastewater, and demonstrates the ability to cope next time.

January's spill wasn't the only such incident in the plant's history, however. Documents provided to the Times show that another big storm -- lasting from Nov. 29 to Dec. 1, 2001 -- forced 110,000 gallons of partially treated wastewater out into Calera Creek without the benefit of the sand filters or the ultraviolet cleaning system.

Gromm attributes those incidents to growing pains at the plant, which had just come online in September of 2000.

"We had to figure out how to change the plant to respond to these high flows," he said. "Since then, I don't think we've had any problems" -- the most recent incident excepted.

But other violations of a different nature have plagued the wastewater plant since its inception.

The Regional Water Quality Control Board fined the Pacifica facility $396,000 for violating its discharge-permit limits 137 times between January 2001 and Nov. 30, 2007.

The list of violations included at least 74 discharges of fecal coliform, 23 discharges of ammonia and two mercury-limit violations, according to documents obtained from the board.

Some of these problems are attributed to the plant's anaerobic digester, which becomes clogged with foam. Plant engineers employed a temporary workaround, and next week, construction crews will begin the process of modifying the machine at a cost of $1 million, according to Gromm.

Other machine malfunctions have also led to fines. In December 2001, a pump station in the neighborhood of Linda Mar discharged over one million gallons of untreated sewage into the ocean, leading to fines of $125,000.

In December 2005, 253,000 gallons of sewage escaped from the Rockaway pump station during a pipe system replacement. Pacifica was fined $190,000 and sued the construction company for negligence.

Reach Julia Scott at 650-348-4340

B. Staffing Requirements Project must minimize number of
required management and staff
positions.
Ponds, vacuum or LPS would have the lowest staff hours as well as ADS pond treatment.
C. Community
Acceptance
Includes consideration of:
• Private property value
A large assessment of $25 to $40 million would be less acceptable than a project of $15 K. Nowhere in California even in areas of high income is there a sewer fee of $250.00 a month...it is outrageous taking of our rights to live under the constitution of the USA.
• Aesthetics
5. Permit ability A. Coastal Permit • Required for any work
• Must be in compliance with the Local
Coastal Plan (LCP) Not in this project
B. Endangered Species
Habitat Areas (ESHA)
Includes considerations of what is
permitted in the ESHA
C. Environmental Includes consideration of the following:
• Endangered Species Protection Act
Many species including homo sapiens will be adversely affected in the endocrine systems as they develop. EDSAP
http://www.cardam.eu/NR/rdonlyres/733613DB-623F-4A8A-B193-B38D28E24103/0/HildaWittersfinal.pdf and
Since 1998 teat are ongoing for all domestic chemicals sold or released into the USA environment http://www.epa.gov/endo/
National Resources Defense Council and other plaintiffs joined and won a decision to force USEPA to go forward with that evaluation.
" In recent years, some scientists have proposed that certain chemicals might be disrupting the endocrine system of humans and wildlife. A variety of chemicals have been found to disrupt the endocrine systems of animals in laboratory studies, and compelling evidence shows that endocrine systems of certain fish and wildlife have been affected by chemical contaminants, resulting in developmental and reproductive problems. Based on this and other evidence, Congress passed the Food Quality Protection Act in 1996, requiring that EPA initiate EDSP to screen pesticide chemicals and environmental contaminants for their potential to affect the endocrine systems of humans and wildlife."
http://www.epa.gov/endo/pubs/edspoverview/index.htm
World wildlife federation
http://wwf.worldwildlife.org/site/PageServer?pagename=can_results_endocrine

Dioxin Exposure, from Infancy through Puberty, Produces E
http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2199303 endocrine Disruption and Affects Human Semen Quality.
There is ample and overwhelming evidence both from studies and common sense that the products we use daily. Prescription drugs, off of the shelf healthcare and cosmetics have levels of toxins and pollutants and other classes of chemicals that effect human health and development…mutagens and carcinogens that remain in sewer effluent after treatment process that is scheduled to be added to our potable and limited water supply for 15,000 people. Add to this the chemicals on the cleaning aisles of supermarkets, hardware and auto parts stores, local dry cleaners, auto Body and other stores that will be added pollutants…over 200,000 and we have a new source of potable water at Broderson that must meet recharge standards. You have failed to meet CEQA requirements to define impacts, classify impacts and meet mitigation standards. Our hope is a SEIR may do so.

Stably transfected human breast cancer cell line,
developed by INSERM (Balaguer et al, 1999) □
Section 7 consultations with US Fish
and Wildlife Service
• Archaeology
• Sensitive species/habitat
• State Marine Reserve
D. Land Uses Includes:
• No other feasible alternative for
ESHA
• Prime agricultural land
• Siting of public utility facilities
E. Engineering Includes the following elements:
• Health and Safety
• Drainage
• Noise
• Odor
• Traffic Trips
• Operational Dependability

5.1AG Exchange is different than reuse as we get potable water for treated effluent.. Using the AG X should be an A priority. ReCip TVA subsurface wetlands vector proof, in Small Flows article and followed by

page 432 DEIR 7-24 Table 7-5 screening level A,B,C
Disagree with the values in penalizing and minimizing bias

Table 7.7 page 456: Wrong $11.4 Capital cost $355,000 O&M

Construction low:
$18 to $21 million
O&M medium:
About $800,000/year.

Page 464 top Wrong… ponds need dredging 15-20 year

Page 474 Other Effluent Disposal Alternatives
Constructed Wetlands Can't harvest water see Clayton County Georgia

Conclusion:

There is evidences of constructive fraud through the process. The values reported in the due diligence, Rough/Fine screening tech memos and the resulting conclusions are based on questionable values. The alternatives were not vetted in some cases leaving out known data from Carollo project that won awards recently…Petaluma Pond/wetland and Carnation WA Vacuum sewer with wetlands.

This plan has a lot of deferred costs and impacts. How ill these be identified in the disposal plans?

Please obtain a copy of Los Osos TAC Report Comments by Tom Ruethr March 30 through April 8, 2007 Dr, Ruehr has 35 years studying this project from the earlier TAC in the 80-90s, was a member of the citizens group that formed the LOCSD "The Solutions Group" and a retired (last year) Soil Scientist at Cal Poly San Luis Obispo. He has information that needs considering in this DEIR…lamellae layered at 2" to 4" depth hold the effluent in the soils and crerate a lateral flow. As I have pointed out earlier. If you do not recognize these problems the CA Coastal Commission or the Courts may. It is after all scientific evidence.

More study needs to be completed and Tom supports my view that Vacuum, Low Pressure and STEP have a superior outcome for collection in these conditions than does gravity. Please invite and evaluate the submissions of LPS, Vacuum and STEP/STEG as well has wetlands and AG exchange.

Thank You AL Barrow Coalition for Low Income Housing and Citizens for Affordable and Safe Environment.

*Eone puts a valve at the septic tank junction to the grinder pump for power outages,

---

From: "abarrow" <abarrow@sbcglobal.net>
To: "Tom Ruehr" <truehr@calpoly.edu>
Cc: "al barrow" <abarrow@sbcglobal.net>
Sent: Saturday, September 01, 2007 5:35 PM
Subject: Fw: :Collection Comparisons, 3 years ago and the myth still stands

----- Original Message -----
From: Mike Saunders
To: 'abarrow'
Cc: 'Bill Cagle'
Sent: Friday, August 24, 2007 11:28 AM
Subject: RE: :Collection Comparisons, 3 years ago and the myth still stands

Mr. Barrow, I have addressed the comments presented by Mr. Taylor. My comments have been added in red type so that they can be differentiated from the comments being made. I have included the initial e-mail for reference purposes. The statements and replies are as follows:

Statement 1: First of all, your system. Even though you often refer to it as STEP/STEG, if the collectors are a uniform 3 to 4 feet below the surface and follow the contour of the ground, then the collectors must be pressurized. Water will not flow up hill (to follow the contour of the ground) unless it is pumped. So you are talking about a pure STEP system. There is no part of it that is STEG.

This statement is incorrect, flow can travel over an up gradient provided that the Static Head (Determined by the tank discharge elevation) is higher than the pressure gradient within the pressure main. The proposed treatment location from the Ripley Report has elevations ranging from 30" to 110' above sea level. The service area in Los Osos has elevations in some areas more than 160' above sea level. This elevation variance does create the possibility that STEG could be utilized. Unfortunately, we cannot determine how much STEG may be utilized until design work is initiated.

While it has never been discussed in the fine screening, because the STEP/STEG system is pressurized, treatment can easily be decentralized to multiple locations. Typically this would be considered in areas that may have a large irrigation need. By decentralizing the treatment, it saves on the cost of force mains and purple irrigation piping. For example, if the golf course has a need for 200,000 gallons of irrigation water per day, 200,000 gallon of treatment could be decentralized to the vicinity of the golf course. The low elevation of the golf course could facilitate the ability for more STEG systems to be utilized..

At this time, we have not seen any pricing that assumes the use of STEG systems. Any systems that could become STEG probably would save about $1000.00 in cost per home. Additionally, O&M cost would probably be about 50% lower per household for each one that uses STEG.

Statement 2: I make the distinction, because the 2000 Oswald Report, was a hybrid. Bill Bownes felt that the lowest lying parts of the Community should be STEP. He was planning to use shallow trenching for these. This system would cover 30%. The 70%, in Bownes' design, would be STEG. As you know, STEG systems require a slightly greater minimum fall than a conventional gravity sewer. So STEG collection systems will go slightly deeper into the ground than conventional.

The minimum fall in a gravity sewer pipe is determined by the minimum flow velocity. Typically the minimum flow velocity for gravity sewer is 2 Ft./sec. The minimum flow velocity is necessary for self cleansing of the sewer pipe (to flush solids out of the main). Generally, flow velocity in gravity sewer pipe is determined by Manning's Equation. Variables in Manning's Equation that affect the determination of flow velocity are the interior pipe characteristics (essentially the amount of pipe friction), the hydraulic radius (this is determined by dividing the cross sectional area of the pipe by the wetted perimeter that is contact with the pipe) and the slope of the pipe.

Relatively speaking, as you increase pipe size, the minimum slope necessary to achieve the minimum flow velocity decreases. However, gravity sewers are typically sized at a minimum of 8" diameter pipe despite the fact

that the hydraulic capacity of an 8" pipe is not required. This project, I believe, is proposing 8" pipe at .16% grade. By Manning's equation, assuming a full pipe, the capacity of this typical pipe is in the range of 400 gpm. This is enough capacity for approximately 700 to 750 homes assuming typical flow rates for single family homes. This size pipe is however, utilized on all pipes. Accordingly, a pipe with capacity for 700 homes may only have 1 home. When you don't have enough homes on the main. which is most often the case, the actual flow velocity will never approach the necessary 2 ft/sec for scouring velocity. Accordingly many states mandate minimum slopes of .4%, mandate minimum flow velocities based on actual hydraulic flow (greater fall) or they initiate an intensive maintenance program to flush lines that are prone to sedimentation. If the gravity system was actually designed to assure minimum flow velocities, I believe that the system depth (deeper) and/or the number of lift stations (more) would be significantly different.the cot of the gravity system would therefore, be higher.

Stating that a STEG system requires more fall is incorrect. In a normal STEG application, the pipe still follows the topography of the land as previously mentioned. Static head, and not pipe gradient, is utilized to move the wastewater. Alternative design options can include an on-site tank discharging to a conventional sewer that empties into a traditional pump station or homes can gravity sewer to a common tank that serves multiple homes. If the wastewater flows through a STEP tank before it enters a gravity pipe, the pipe friction will be less and the need for a minimum flow velocity can be reduced from 2 ft/sec to 1 ft/sec since there are significantly less solids in the raw wastewater. In theory, the slope of a gravity sewer receiving flow from only STEG tanks could require as little as half the slope as one receiving conventional wastewater flow only. If the wastewater was gravity flowing to a common tank serving more than one house, the slope would be exactly the same.

Statement 3: So, in your STEP system, the 204,000 linear feet of collectors would cost $3.4 million. There would be about 4800 laterals that would have to be hooked up. Using Tidwell's figure of $3500, this would come to about $16.8 million. The combination would be $20.2 million. I doubt that the figures include a 10% contingency, inflation escalator, etc. but let's go with that.

If we are anticipating 4800 connection, We would generally anticipate the following methodology would be utilized. First, we have to recognize that STEP mains, just like water mains, are constructed in the green area adjacent to the road and not within the black-top area. Also, a service is typically 1" in diameter. Additionally, the main is generally on the opposite side of the road from the water main. Accordingly we should anticipate that 1/2 of the laterals would be what we call long side services (they must cross under the road) and 1/2 would be short side laterals. Therefore approximately 2400 homes require long side laterals. Most often, long side laterals can be combined to serve two homes (just like water services). With this in mind, we can now state that approximately 1200 long side service would be required with construction of the main. A long side service, installed using a mole to cross under the road (rather than cutting the road), will typically cost in the range of $900.00 each. Therefore long side services can be anticipated to cost around $1.1 million total.

The short side services can be installed with the main or they can be installed when the on-lot connection is made. While these services can and will serve two homes when convenient, often individual service can be more cost effective since they can reduce the on-site cost. If the laterals are installed concurrently with the main we would expect the cost per lateral to be in the range of $500/each. If we ran individual services, this cost would be in the rang of $1.2 million. If we combine services to double services, where it make sense to do so, we could probably get this cost down to the $800,000 range. When the on-site work is done, the contractor is already excavating to within 5' of the new main. Deferring the lateral installation until the on-site work is done, could probably push this cost to less than $500,000.

I would speculate that the actual cost of services is more in the range of $2,000,000 - $2,500,000.

It should also be noted that vacant property does not require a lateral when the main is constructed. Laterals can be tapped onto the main, when the property is developed. While we haven't quantified this cost reduction, it may be fairly substantial.

Contingency is not a real cost number, it is money set aside to pay for additional costs that were possibly unforeseen during the design process. During this analysis, the word contingency has been thrown around liberally and has been applied inequitably between STEP (30%) and gravity sewer (10%). The potential for additional cost due to unforeseen impacts is very low for STEP. Since it is pressure main and because it is small diameter pipe, changes can be made to accommodate unknown utilities, rocks, drainage structures, etc. simply by deflecting the pipe (no fittings). Accordingly there is no cost impact. Gravity sewer, being grade dependent, has huge cost implications when unknown construction impacts are encountered. It should be understood that

contingency should be based on construction risk and therefore should be much higher for gravity sewer.

Statement 4: If we go back to MWH's 5/30/03 cost estimates, we find that the collection system itself was figured at $32.8 million. But to compare to a STEP system, we have to include the pump stations as well. These are $3.5 million. The combination, then, is $36.3 million.

The need for pump stations in pressure systems is determined by the ability of the individual on-site pumps being utilized. Orenco utilizes a multi stage wastewater pump specifically designed and constructed for this application. The shut-off head approaches 240'. Additionally, because solids are removed from the wastewater stream, pipes can be liberally oversized to reduce pressure loss within the pipe. We do not anticipate the need for any lift stations in a community of this size as all of the pumps will pump directly to the point of treatment. Accordingly the capital cost and O&M costs are not applicable.

Statement 5: Clearly, there appears to be a tremendous cost saving from STEP. But any such comparison as this has to include the property owner's cost as well.

At no time has any analysis of wastewater for Los Osos considered the varied cost models between STEP and gravity. In fact, every effort has been made to place STEP into the same model as gravity sewer. The inherent problem with gravity sewer is the high up-front cost. That is because the bulk of the cost is in the collection main. Additionally, all of the O&M costs are generally attached to the main and the lift stations. Accordingly, to keep O&M costs down, on a per customer basis, customers must be quickly be connected so that they start sharing the cost. When customers do not connect, existing customers will pay an inequitable share of O&M costs.

There is this misconception that gravity sewers have low O&M costs. People need to understand that gravity sewers have a low *initial* O&M cost. Aging gravity sewer systems are becoming problematic in this Country, and the real costs are becoming more documented. The average age of a gravity system in the Unties States in a little more than 30 years. As the system ages, I&I (inflow & infiltration of extraneous water), expensive R&R (Renewal and Replacement), expensive system failures, SSO's (Sanitary Sewer Overflows), on-site lateral replacement, all have potentially huge cost implications. Growing communities are often able to keep these costs somewhat in-check to their customers by the addition of lower maintenance new gravity systems that help distribute the impact of aging systems to more customers. Small communities, in particular, that have aging gravity systems, without developing areas, are starting to experience significant financial hardships with regards to O&M of gravity sewer systems. Most often these communities are asking for financial assistance from State and Federal Agencies. The gap between the financial needs and financial assistance available to help defray costs is trending towards a larger financial gap.

Despite this, gravity sewer continues to get a free pass in most analysis. What I mean by this is that the Consulting Community continues to preach the benefits of new pipe materials and they get away with quoting costs from new gravity sewer systems. If gravity sewer were to be placed under the scrutiny that emerging systems such as STEP receive, people would be horrified. I've attached an interesting paper for anyone that is interested.

By comparison O&M costs are typically quoted as high end cost. No consideration is given to the fact that these systems have extremely low maintenance cost during the initial 7 to 10 years of operation. Pumps last 20 years, tanks pump-outs are 10 years and the call-out rate is probably in the range of one call-out per 10 years. Does 500 call-outs per year at 30 minutes per call over the initial 7 years sound expensive, complicated or excessive? O&M cost for STEP are normally quoted in terms of average cost and are inclusive of R&R and tank pump-outs. Do you think that $450,000 includes R&R of lift Stations, manholes and gravity sewer mains.

The on-site capital cost for STEP can be a deferred cost. What this means is that while on-site infrastructure can be installed as part of the main project, there are also opportunities to defer the installation until service is required. This deferral of cost and infrastructure, creates opportunities for alternative financing, lower initial financing and more ability to focus cost assistance to those in financial need. For STEP systems, O&M costs are extremely low for the collection mains and are almost entirely associated with the on-site infrastructure. Accordingly, the O&M cost does not become an issue until you have a paying customer. Unlike gravity sewer, this keeps O&M costs in line with revenue being generated. The homeowner does not have any direct on-site O&M costs with the exception of electrical costs estimated to be in the range of $12.00 annually. The system is intended to be publicly owned with the monthly bills being charged just like any other centralized sewer system. In fact, the homeowner has less liability, since they only own a very short lateral to the tank rather than being

responsible for a long lateral extending to the property line. Lateral replacement is costing homeowners in older systems anywhere from $3,000 to $20,000 to replace when they fail.

Statement 6: In the Project Report, MWH estimates homeowners' cost at $9.4 million for the lateral, decommissioning septic tank, etc. This included 20% for contingency and 2% for inspection, etc. For comparison purposes, it would probably be reasonable to figure only about $1000 would be for the lateral itself.

The on-site portion of the lateral is typically a 1" pressure pipe and is generally installed with a walk-behind trencher. We would considered the on-site costs that were stated to be more than inclusive of this small cost. The costs for the lateral extension from the main has already been discussed.

Statement 7: In the STEP system, there would be about $1500 for the pump, chamber, controls, separate electrical service, etc. With the $1000 for the lateral, this is $2500/home or $12 million for the project. This would raise the STEP system to $32.2 million. Total at this point is $45.7 million for the current project.

We've already discussed the methodology for installation of the main. We should add that the main can be installed trenchless or by open-cut. Directional boring is utilized as the trenchless method for installing small diameter pressure pipe and is utilized when logistics or cost impacts such as driveways, roadways, trees, etc make open trenching a more expensive. We provided the County with a bid tab of a STEP project that was entirely directional bored and the cost worked out to slightly less than $40/ft inclusive of laterals (both sides) and all taxes, overhead and profit. The pipe size was larger than we would generally need in Los Osos, so the cost is probably conservative. We have also provided the County with a bid tab of a project that was completely trenched that came in at a cost slightly below $20/ft. 230,000 feet of pipe at $40/ft is less than $6,000,000. While we don't necessarily suggest that this is the number that should be utilized for analysis, we would suggest that the high end costs stated in the fine screening report should be carefully scrutinized. We believe that the Ripley estimates were a good conservative estimate of STEP costs for budgetary consideration. Typically, on-site installations costs are available but have ranged from $3,500 to $7,500 inclusive of all materials, labor, taxes and profit. This work includes connection to the main. Additionally we would consider $500 per home to be a reasonable cost to provide a dedicated 110V circuit from the home. The fine screening uses electrical drops from the public right-of-way with SRF requirements as justification. At $6,000 per home, we would speculate the overall on-site cost, based on typical costs we see, is in the range of $30,000,000. Again this is a typical cost, not a budgetary conservative cost.

Statement 8: But, next comes the part you won't like. MWH figured it would cost about $20 million to replace all of the septic tanks. Dana Ripley agreed. Experts in the field (Bill Bownes, MWH, Dana Ripley, for starters) all will say the septic tanks should be replaced. Bownes has designed over 100 STEP or STEG systems and 100% of the septic tanks were replaced in all but 3 of these projects.

STEP programs have been done where the existing tanks have been utilized. Generally, there are some inherent risks in adopting this methodology because existing septic tanks are generally sized smaller than a STEP tank. Additionally, it is rare to see water-tight septic tanks that are build to the quality that we mandate for our STEP installations. If we were to consider utilization of the existing tank we could probably anticipate a savings in the rang of $1500 per connection. This savings however, would probably translate into higher maintenance costs, less efficient solids digestion in the tanks, higher potential of I&I and more likelihood of tank failures (structural).

We would also recommend that tanks be replaced. We would consider the costs that have been discussed to be inclusive of tank replacement.

Tank replacement is not as cumbersome as the fine screening would lead you to believe. The analysis shows the new tanks being installed in an adjacent location to the existing tank with decommissioning of the existing tank. It also states that all new tanks will be installed in the front yard. We would suggest that this method causes too much disruption to the property and incurs unnecessary costs for additional plumbing ,excavation and sodding. We would suggest that it is more appropriate to remove the existing tank and replace it with a new tank in the same location. Excavated material, being less, is placed on a tarp to avoid impact to the existing sod and plywood be utilized under the equipment tracks to avoid rutting. The existing tanks can be removed and staged at a common location for crushing and possible reclamation as aggregate or structural fill.

We have heard that the impact to make a STEP connection will be more than gravity. We do not see this as a true statement. The STEP connection will require excavation of the existing tank, backfilling and restoration. The

service line can be trenched with a walk-behind trencher with very little impact or restoration required. By comparison a gravity connection requires excavation of the existing tank with removal, or crushing in-place being the most common decommissioning techniques. Plumbing must than be installed from the home to a typical depth of 4" at the property line. This trench is typically at least 12" wide and requires compaction and restoration. Also, a gravity connection will often traverse a property to connect to a common why shared with a neighbor.

Having stated our preference for tank replacement, there will still be opportunities that we would consider appropriate for utilization of the existing tank. Typically, multi-family complexes and commercial buildings have liberally sized septic tanks that are of better structural quality. These installation should be evaluated on a case-by-case basis for consideration of utilizing the existing tank. Also, the fine screening states that rear lot septic tanks will be pumped to the front lot location with a grinder pump. The logic applied, is that these tanks may be inaccessible for the equipment necessary to install a new tank. It is important to note that new excavation equipment is available to get into every tight locations. Also, fiberglass tanks can be utilized to avoid the need for large equipment capable of lifting a heavy tank. After these options are considered, and if it the existing tank is still deemed inaccessible, we would recommend installation of a STEP package into the existing tank. We would never recommend that the O&M cost for the additional grinder pump ($600/yr) be incurred, nor would we recommend that the capital cost ($2500-$5500) be incurred for the grinder pump and alternative tank location. Incidentally, the cost of 200 grinder pumps that were identified in the gravity sewer analysis do not appear to be adequately quantified in terms of cost.

Statement 9: The problem is the limited hydraulic capacity of the STEP collection system. When you change from the 8" conventional collector to a 3" STEP collector, there is a reduction of 86% in hydraulic capacity. This is pretty gross. Particularly since septic tanks are not really made to be watertight to infiltration from above. Water in the soil above from rain will find its way into (and out of) the tank through the lids (particularly if tree roots have entered) and the crack between the sides and the top. In a STEG system, essentially every tank, at about the same time, will put a few quarts of effluent into the collection system. Even though each tank does not add much, the combination of all tanks, at the same time, will overwhelm the system.

This reply has already touched on hydraulic capacity. It is true that an 8" gravity main typically can hold much more capacity than is necessary. One should consider however, that aging gravity sewers have generally eaten up this capacity when I&I overcomes the system. I&I, in many aging systems, can easily be a multitude of time higher than the average daily flow from homes. In fact SSO's (Sanitary Sewer Overflows) are common in gravity mains that have excessive capacity for residential flow.

To state that a gravity main has 86% more capacity than a 3" STEP main is incorrect. One pipe is gravity flow, laid at minimum velocities and one is a pressure pipe. As already stated, the gravity sewer pipe has about 400 gpm capacity when flowing full at 2ft/sec (capacity and flow velocity can be increased with greater fall, but of course capital costs will also increase). By comparison a 3: pressure pipe can handle flows of 5ft/sec on average. Also, higher velocities can be handled on an intermittent basis during periods of higher flow rates. The capacity of a 3" pipe at 5ft/sec is around 100 gpm. Also, intermittent flow up to 150 gpm probably wouldn't cause much concern. The critical point however, is that peak flow during rain events will never approach that of a gravity system. Accordingly, STEP pipes can be designed much closer to actual flows that gravity sewer can ever be. Additionally, with STEP, you can oversize the pipe for additional capacity with little or no detrimental effects. Again, since STEP doesn't have solids to settle out, flow velocities are not as critical, and oversizing can be more easily considered. If an 8" STEP main were utilized, we would generally estimate the capacity to be in the range of 800 gpm, twice that of gravity sewer.

Statement 10: It is virtually impossible to analyze the reaction of a STEP system. The infiltration will go into the pump chamber. Typically, this will store effluent, and when the float switch says it is full, pump out 50 gallons. The infiltration will cause more pumps to “fire” than would normally be the case. And each “firing” will put 50 gallons into the system.

By replacing the on-site septic tank, we are installing an engineered tank and pump, designed to be water-tight. During construction, each installation is tested to show it is water-tight. If for some reason, the tank is compromised and infiltration did occur, it can be detected by checking pump-run times. If you want the system to be absolutely water-tight, telemetry can be added to each on-site system that will notify the operator of extraneous flow into the tank.

It is not impossible to analyze a STEP system. In fact the lower impact from I&I and the fact that it is pressurized

with a common pump from each residence makes modeling a STEP system fairly easy. Water systems are modeled the same way. By comparison, I would venture that gravity sewers can be much more problematic to accurately model because of extraneous factors such as I&I.

Theoretically, in an event that more pumps "fire" than was expected during design, pumps further from the discharge would hit shut-off head. This means that they do not have ample pumping capability to pump against the existing line pressure. If this would ever occur, the pumps closer to the discharge would still pump and would eventually reach the pump-off level. As they shut-off, line pressures would drop and adjacent pumps would be allowed to activate. STEP tanks that were locked against existing line pressures would alarm to tell the operator that they have not pumped. However, each installation has more than a days storage before they would ever reach overflow. Eventually all pumps will discharge.

Statement 11: But, this is not the kind of thing that people like you and I can have a good feel for. That is why experts were born. And, their feeling is probably one based on experience – not theoretical concepts. If the $20 million is added to the STEP system, we end up at $52.2 million for the STEP system and $45.7 million for the current.

Experts have weighed in and largely have been ignored. Everything that has been presented is generally theoretical. I would like to think that Orenco, with 25 years of experience in STEP and more than 150,000 STEP systems in service would qualify as an expert. Additionally, having spent 9 years as the Technical Services Manager for the largest and oldest STEP system in the World, probably validates my statements. In that position I salvaged a failed conventional sewer program ($600,000,000) and managed to satisfy the State with a 5000 property STEP initiative. I also constructed STEP to more than 14,000 properties in an area that had been stalled for 20 years because property owners could not develop without sewer.

Statement 12: It is also important to point out that the relatively small ($1.5-2K/home) homeowner's cost for the regular system would zoom to something like $6.5-7K. And this has to be borrowed at a rate 2-3 times higher than the SRF loan. Any consideration for the cash-strapped homeowner would rule against this increase.

We believe that the on-site cost can be handles in a multitude of ways that can make it affordable to the homeowner. Also it allows for those that are experiencing financial hardship to be identifies with assistance tailored to their ability to pay. The problem is that all typical financing is tailored toward the conventional model. We would state that this is proving to be a highly inefficient way to allocate public assistance such as SRF loans or grants. Orenco has continued to state that an RFP allows teams to show a complete solution with bottom-line costs and with explanation of how a different expenditure model can be leveraged to assist homeowners.

Statement 13: One further word. To take a chance and go against the expert advice might work out. Then again, it might not. If not, the cost of the fix will be astronomical. And no one can be held accountable except the owner (CSD, city or whatever) because they overrode the advice of the engineer.

STEP systems have been in existence for 35 years. Orenco has been installing STEP systems for 25 years. STEP is not a new system as it is so often painted. Orenco has stated that private operations can be included in a proposal if they have concerns such as the ones you have stated.

Statement 14: There are no magical systems, Al. I am truly sorry. But that is a fact.

The message that we have always shared is that septic abatement is not a one-system-fits-all solution. Gravity sewer, despite statistical data that shows that smaller communities are struggling to maintain, gets placed a free pass in virtually every evaluation. The decisions on technology most often are placed in the hands of consultants who's fees are based on capital cost. We firmly believe that an RFP for a design/build/finance project is truly the best method to assure that the best solution is properly aired, evaluated and initiated. While an RFP affords competing technologies to show what they can achieve it in no way diminishes the ability of conventional approaches to show they are the better choice.

Thank you fro the opportunity to address these concerns.

Respectfully,

Michael L. Saunders
National Accounts Leader
Orenco Systems, Inc.

msaunders@orenco.com

Office 1-800-348-9843 (Extension 443)
Cell 941-276-8586
Fax 941-764-6069

Visit our web site at www.orenco.com

From: abarrow [mailto:abarrow@sbcglobal.net]
Sent: Friday, August 24, 2007 1:51 AM
To: mike saunders
Cc: al barrow
Subject: :Collection Comparisons, 3 years ago and the myth still stands

hello Mike;

If you have a few minutes you could print between the lines in red to clear some of this up.

Al Barrow, President, Citizens for Affordable and Safe Environment & Coalition for Low Income Housing

----- Original Message -----
From: Gordon Taylor
To: Al Barrow
Sent: Friday, August 27, 2004 7:12 PM
Subject: Collection Comparisons

Al,

It is interesting to play with the numbers for a collection system. You never can tell where you will end up.

First of all, your system. Even though you often refer to it as STEP/STEG, if the collectors are a uniform 3 to 4 feet below the surface and follow the contour of the ground, then the collectors must be pressurized. Water will not flow up hill (to follow the contour of the ground) unless it is pumped. So you are talking about a pure STEP system. There is no part of it that is STEG.

I make the distinction, because the 2000 Oswald Report, was a hybrid. Bill Bownes felt that the lowest lying parts of the Community should be STEP. He was planning to use shallow trenching for these. This system would cover 30%. The 70%, in Bownes' design, would be STEG. As you know, STEG systems require a slightly greater minimum fall than a conventional gravity sewer. So STEG collection systems will go slightly deeper into the ground than conventional.

So, in your STEP system, the 204,000 linear feet of collectors would cost $3.4 million. There would be about 4800 laterals that would have to be hooked up. Using Tidwell's figure of $3500, this would come to about $16.8 million. The combination would be $20.2 million. I doubt that the figures include a 10% contingency, inflation escalator, etc. but let's go with that.

If we go back to MWH's 5/30/03 cost estimates, we find that the collection system itself was figured at $32.8 million. But to compare to a STEP system, we have to include the pump stations as well. These are $3.5 million. The combination, then, is $36.3 million.

Clearly, there appears to be a tremendous cost saving from STEP. But any such comparison as this has to include the property owner's cost as well.

In the Project Report, MWH estimates homeowners' cost at $9.4 million for the lateral, decommissioning septic tank, etc. This included 20% for contingency and 2% for inspection, etc. For comparison purposes, it would probably be reasonable to figure only about $1000 would be for the lateral itself.

In the STEP system, there would be about $1500 for the pump, chamber, controls, separate electrical service, etc. With the $1000 for the lateral, this is $2500/home or $12 million for the project. This would raise the STEP system to $32.2 million. Total at this point is $45.7 million for the current project.

But, next comes the part you won't like. MWH figured it would cost about $20 million to replace all of the septic tanks. Dana Ripley agreed. Experts in the field (Bill Bownes, MWH, Dana Ripley, for starters) all will say the septic tanks should be replaced. Bownes has designed over 100 STEP or STEG systems and 100% of the septic tanks were replaced in all but 3 of these projects.

The problem is the limited hydraulic capacity of the STEP collection system. When you change from the 8" conventional collector to a 3" STEP collector, there is a reduction of 86% in hydraulic capacity. This is pretty gross. Particularly since septic tanks are not really made to be watertight to infiltration from above. Water in the soil above from rain will find its way into (and out of) the tank through the lids (particularly if tree roots have entered) and the crack between the sides and the top. In a STEG system, essentially every tank, at about the same time, will put a few quarts of effluent into the collection system. Even though each tank does not add much, the combination of all tanks, at the same time, will overwhelm the system.

It is virtually impossible to analyze the reaction of a STEP system. The infiltration will go into the pump chamber. Typically, this will store effluent, and when the float switch says it is full, pump out 50 gallons. The infiltration will cause more pumps to "fire" than would normally be the case. And each "firing" will put 50 gallons into the system.

But, this is not the kind of thing that people like you and I can have a good feel for. That is why experts were born. And, their feeling is probably one based on experience – not theoretical concepts. If the $20 million is added to the STEP system, we end up at $52.2 million for the STEP system and $45.7 million for the current.

It is also important to point out that the relatively small ($1.5-2K/home) homeowner's cost for the regular system would zoom to something like $6.5-7K. And this has to be borrowed at a rate 2-3 times higher than the SRF loan. Any consideration for the cash-strapped homeowner would rule against this increase.

One further word. To take a chance and go against the expert advice might work out. Then again, it might not. If not, the cost of the fix will be astronomical. And no one can be held accountable except the owner (CSD, city or whatever) because they overrode the advice of the engineer.

There are no magical systems, Al. I am truly sorry. But that is a fact.

From: "albarrow" <abarrow@sbcglobal.net>
To: "Gail McPherson" <ronmcpherson@earthlink.net>; "Jim Tkah" <jimtk@charter.net>; "Lisa Schicker" <lisaschicker@charter.net>; <truehr@oboe.aix.calpoly.edu>; "Chuck Cesena" <clcesena@charter.net>; "Steven Senet" <stevensenet@yahoo.com>
Cc: <abarrow@sbcglobal.net>
Sent: Wednesday, March 02, 2005 9:15 AM
Attach: cap_168167.jpg
Subject: $21,900,000

Hello,
Here is a great picture of an RO plant. Because San Jaun has an ocean outfall (assumption) which we won't trucking brine will add 60x $1000.00 gallon brine tankers to Ventura a day that adds up to $21,900,000.00 a year. For our picture gallery this one is easy to understand their is no room on the Tri-W for this.

This is a defferred expense for providing drinking water for buildout.
Thank You,
Al Barrow C.A.S.E.

Downtown San Francisco Groundwater Basin

- Groundwater Basin Number: 2-40
- County: San Francisco
- Surface Area: 7,600 acres (12 square miles)

Boundaries & Hydrology

The Downtown San Francisco groundwater basin is located on the northeastern portion of the San Francisco peninsula, and is one of five basins in the eastern part of San Francisco each separated from the other by bedrock ridges (Phillips et.al. 1993). The groundwater basin is made up of shallow unconsolidated alluvium underlain by less permeable bedrock within the watershed located east and northeast of the Twin Peaks area including Nob and Telegraph Hills to the north and Potrero Point to the east, as well as most of the downtown area. Bedrock outcrops along much of the ridge form the northeastern and southern basin boundaries. In general, groundwater flow is northeast, following the topography. Average precipitation within the basin is approximately 24 inches per year.

Hydrogeologic Information

Water Bearing Formations

The primary water-bearing formations are comprised of unconsolidated sediments and include alluvial fan deposits, beach and dune sands, undifferentiated alluvium and artificial fill. The oldest of these sediments are Pleistocene in age (Knudsen et.al. 2000). Water-bearing formations are thickest beneath the central and northeastern portion of the basin (between Interstate 80 and Chinatown) where bedrock is encountered at less than 300 feet below ground surface. In much of the basin bedrock is encountered at less than 200 feet below ground surface (Phillips et.al. 1993). Bedrock underlying the basin consists of consolidated rocks of the Franciscan Complex (Schlocker 1974).

Groundwater Recharge

Groundwater recharge to the groundwater basin occurs from infiltration of rainfall, landscape irrigation, and leakage of water and sewer pipes. Recharge to the Downtown San Francisco groundwater basin was estimated to be 5,900 ac-ft per year. Recharge due to leakage from municipal water and sewer pipes accounted for about half of the total recharge of groundwater in the San Francisco area (Phillips et.al. 1993).

Groundwater Level Trends

No published water level data showing long-term groundwater level trends was found for the basin, however measurements taken from 1988 to 1992 indicate little to no seasonal fluctuations in groundwater levels.

Groundwater Storage

No published groundwater storage information was found for the basin.

Groundwater Budget

A hydrologic routing model was developed by the USGS to estimate groundwater recharge on the San Francisco peninsula. The model was based on land use zones in the region. A detailed discussion of the groundwater budget can be found in the report by Phillips et.al. (1993).

Groundwater Quality

Characterization. No published groundwater quality information was found for the Downtown basin, however limited water quality data for the surrounding basins is available and shows that the general character of groundwater for all basins beneath the entire San Francisco peninsula is similar (Phillips et.al. 1993). Groundwater beneath the San Francisco peninsula is a mixed cation bicarbonate type, and considered generally "hard" ($CaCO_3$ concentrations between 121 and 180 mg/L). Concentrations of most major dissolved constituents are within the guidelines recommended by the U.S. EPA. Total dissolved solids vary from about 200 to over 700 ppm. Elevated concentrations of nitrate and chloride are common, especially at shallower depths (Phillips et.al. 1993).

Impairments. Groundwater within the Downtown basin is subject to high concentrations of nitrates and elevated chloride, boron and total dissolved solids concentrations. High nitrate levels and are attributed to groundwater recharge from sewer pipe leakage and possibly to fertilizer introduced by irrigation return flows. Elevated chloride and TDS levels are most likely due to a combination of leaky sewer pipes, historic and current seawater intrusion, and connate water (Philips et.al. 1993).

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: N/A	Average: N/A
	Total depths (ft)	
Domestic	Range: N/A	Average: N/A
Municipal/Irrigation	Range: N/A	Average: N/A

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
	Groundwater Levels	N/A
	Water Quality	N/A

Basin Management

Groundwater management:

Water agencies

Public	San Francisco Water Department
Private	

References Cited

Blake, M.C., Graymer, R.W., and Jones, D.L. 2000. *Geologic Map and Map Database of Parts of Marin, San Francisco, Alameda, Contra Costa, and Sonoma Counties, California*. U.S. Geological Survey Miscellaneous Field Studies MF 2337, Online Version 1.0. (available online at http://geopubs.wr.usgs.gov/map-mf/mf2337/) .

Bonilla, M.G. 1998. Preliminary geologic map of the San Francisco South 7.5' quadrangle and part of the Hunters Point 7.5' quadrangle, San Francisco Bay area, California: A digital database. U.S. Geological Survey Open-File Report 98-354. (available online at http://wrgis.wr.usgs.gov/open-file/of98-354/)

Knudsen, K.L. et.al. 2000. Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California: A Digital Database. U.S. Geological Survey Open-File Report 00-444. (available online at http://geopubs.wr.usgs.gov/open-file/of00-444/).

Knudsen, K.L., Noller, J.S., Sowers, J.M., and Lettis, W.R. 1997. *Quaternary Geology and Liquefaction Susceptibility, San Francisco, California 1:100,000 Quadrangle: A digital database.* U.S. Geological Survey Open-File Report 97-715. (available online at http://wrgis.wr.usgs.gov/open-file/of97-715/)

* Phillips, S.P., Hamlin, S.N., and Yates, E.B. 1993. *Geohydrology, Water Quality, and Estimation of Ground-water Recharge in San Francisco, California, 1987-92.* U.S. Geological Survey Water-Resources Investigations Report 93-4019. Prepared in cooperation with the San Francisco Water Department. 69 p.

Schlocker, Julius. 1974. *Geology of the San Francisco north quadrangle, California.* U.S. Geological Survey Professional Paper 782. 109p.

* Denotes that the reference is a key one for the basin

Errata

Changes made to the basin description will be noted here.

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

STAFF SUMMARY REPORT
STAFF: Michael T. Chee
MEETING DATE: September 15, 2004

ITEM: 8

SUBJECT: **City of Petaluma, Water Pollution Control Plant, Petaluma, Sonoma County –** Hearing to Consider Mandatory Minimum Penalty for Discharge of Partially Treated Wastewater to Waters of the State

CHRONOLOGY: October 2000 -Mandatory Minimum Penalty (MMP)
February 2002 -MMP
August 2003 -MMP

DISCUSSION: The City of Petaluma Water Pollution Control Plant violated of its effluent limits on 35 occasions during the period between January 1, 2000, and April 30, 2004. Twenty-nine of these violations are subject to mandatory penalties for a total penalty of $87,000.

Petaluma has waived its right to a Water Board hearing (Appendix B), and intends to undertake a supplemental environmental project (SEP). The proposed SEP is for the Wetland Habitat Studies Program (WHSP). WHSP will provide students and the general public with opportunities to tour and study upland habitats, ponds, freshwater marshes, tidal wetlands, and mudflats at Shollenberger Park that is located adjacent to the Petaluma Marsh and River. SEP funds will also assist the Casa Grande High School in developing a native plant nursery to provide plants for student planting within the Petaluma watershed. The attached complaint proposes civil liability in the amount of $87,000, of which $51,000 will be suspended to fund the SEP.

RECOMMEN-
DATIONS: *No action required.*

File No.: 2149.4006 (MTC)

Appendix: A. Complaint No. R2-2004-0041
Appendix: B. Signed waiver

From: "abarrow" <abarrow@sbcglobal.net>
To: "piper reilly" <kismetwest@sbcglobal.net>
Cc: "Lois Capps" <greg.haas@mail.house.gov>; "Congresswoman Lois Capps" <ca23ima@mail.house.gov>; <governor@governor.ca.gov>; <jlenthall@co.slo.ca.us>; "jim patterson" <jpatterson@co.slo.ca.us>; "katcho achadjian" <kachadjian@co.slo.ca.us>; "harry ovitt" <hovitt@co.slo.ca.gov>; "'Bruce Gibson'" <bgibson@thegrid.net>; <jwaddell@co.slo.ca.us>; "john diodati" <jgdiodati@co.slo.ca.us>; <pogren@co.slo.ca.us>; "al barrow" <abarrow@sbcglobal.net>; "Tom Ruehr" <truehr@calpoly.edu>; "Dana Ripley" <ripac@comcast.net>; <bcagle@orenco.com>; "mike saunders" <msaunders@orenco.com>; "Phil veneris" <phil.veneris@fire.ca.gov>; <Assemblymember.Blakeslee@assembly.ca.gov>; "Bill" <bill.garfinkel@sbcglobal.net>; <achill29@hotmail.com>
Sent: Monday, November 12, 2007 1:57 PM
Subject: ABAG The Real Dirt on Liquefaction - Pipelines.htm

Hello Piper and all officials;
We are on an earthquake fault. If you put the sewer water on Broderson after treatment a very large water mound will form (purposely) a very large liquifaction zone which, on that slope turns the unlerlain soils to jelly! Slippage of house foundations could happen and gravity sewer pipes will have huge pressure separating the joints. In the December 2003 Loma Prieta earthquake the central coast area did not inspect the sewer mains for leaks.

"In earthquakes, utility pipelines leak and break. The most vulnerable pipelines are typically those carrying sewage because they are made of the most brittle materials and do not have sealed joints. The next most vulnerable are water pipelines. Some pipelines carrying natural gas are also vulnerable, but utilities such as Pacific Gas & Electric are upgrading and replacing vulnerable pipelines as described below."

"ABAG, in examining pipeline breakage statistics from the Loma Prieta earthquake, concluded that the damage to pipelines in areas mapped as highly susceptible to liquefaction experienced significantly greater damage than areas with lower susceptibility, given similar shaking levels."

Not only will gravity sewer lines but water mains and gas lines will be act risk from earthquake liquifaction conditions as the Broderson effluent mound will be 160 deep on a 7% slope overlayong the Los Osos Strand B fault that runs under the fire department (damaged then) without liquefaction conditions from Broderson. Any gravity design needs to budget the repair cost to those infrastructures. This is earth quake country and we are sitting on a very big fault.

AL Barrow

What Happens?
Utility Pipelines Leak

Excerpts From "The REAL Dirt on Liquefaction"

What Happens?

In earthquakes, utility pipelines leak and break. The most vulnerable pipelines are typically those carrying sewage because they are made of the most brittle materials and do not have sealed joints. The next most vulnerable are water pipelines. Some pipelines carrying natural gas are also vulnerable, but utilities such as Pacific Gas & Electric are upgrading and replacing vulnerable pipelines as described below.

Why Does This Happen?

Utility pipelines can leak or break due to the passage of earthquake waves through the soil or due to permanent ground displacement (such as faulting, landsliding or liquefaction). Even though areas susceptible to liquefaction are a relatively small percentage of the areas in which pipelines are located, these liquefaction-susceptible areas have contained a disproportionate number of breaks.

What Were the Pipe Damage Statistics in the Loma Prieta Earthquake?

ABAG, in examining pipeline breakage statistics from the Loma Prieta earthquake, concluded that the damage to pipelines in areas mapped as highly susceptible to liquefaction experienced significantly greater damage than areas with lower susceptibility, given similar shaking levels.

First, the number of water pipeline leaks per mile of water pipeline in areas mapped as having high and very high susceptibility to liquefaction was four-to-six times greater than outside of these areas, given equivalent shaking intensities.

Example of main sewage treatment conduit rupture in the 1995 Kobe Earthquake.
Source - Kobe Geotechnical

Second, the number of leaks per mile of natural gas pipelines was three-to-eleven times greater within the areas mapped as having high and very high susceptibility than outside of these areas, given equivalent shaking intensities. The gas pipeline leaks were predominately in cast iron and other older pipelines that are known to be vulnerable to earthquake effects.

Much of the pipeline damage occurred in areas where no surface expression of liquefaction was observed. Thus, these statistics show increased damage in areas mapped as being susceptible to liquefaction; they do not

Collection, Earthquake Engineering Research Center, Univ. of California, Berkeley

indicate that the damage was necessarily due to liquefaction. See Appendix C for more information.

Note that no damage surveys were conducted of sewer lines as a result of the Loma Prieta earthquake, so no data on statistical damage to these facilities are available. However, as stated above, sewer lines probably had more damage than water lines because they are more brittle and do not have sealed joints.

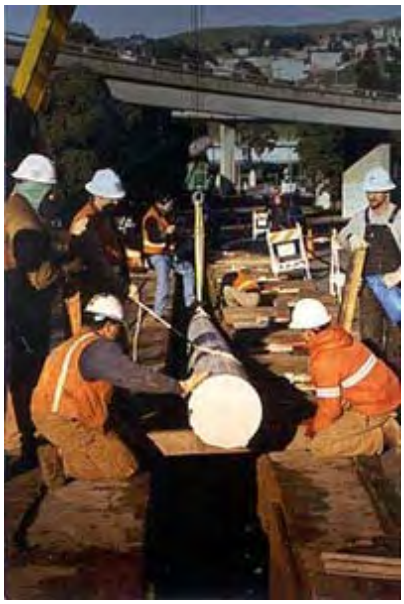
Utilities and the Seismic Hazard Mapping Program of the California Division of Mines and Geology (CDMG)

The following excerpt from CDMG Special Publication 117, Chapter 6 (1997) notes the concern of that organization for pipeline damage in areas subject to liquefaction:

> To date, most liquefaction hazard investigations have focused on assessing the risks to commercial buildings, homes, and other occupied structures. However, liquefaction also poses problems for streets and lifelines- problems that may, in turn, jeopardize lives and property. For example, liquefaction locally caused natural gas pipelines to break and catch fire during the Northridge earthquake, and liquefaction-caused water line breakage greatly hampered firefighters in San Francisco following the 1906 earthquake. Thus, although lifelines are not explicitly mentioned in the Seismic Hazards Mapping Act, cities and counties may wish to require investigation and mitigation of potential liquefaction-caused damage to lifelines.

Pg&E's Gas Pipeline Replacement Program (GPRP)

Beginning in 1985, PG&E undertook a 25-year, $2.5 billion program, known as the Gas Pipeline Replacement Program (GPRP). As a result of the GPRP, many pipeline upgrades were installed both prior to and following the Loma Prieta earthquake. These upgrades are continuing. The newer pipelines are significantly less vulnerable to earthquake effects, including liquefaction, differential settlement, violent shaking, and ground strain, than the older types of pipe installed 50 - 100 years ago.



Gas pipelines being replaced in San Francisco
Source - W. Savage, PG&E

New Guidelines for Pipeline Systems Are Being Developed

In response to the lack of a national code for pipeline systems, the American Lifelines Alliance (ALA) is developing two guideline documents:

1. on the design of water transmission systems to resist earthquake hazards, including liquefaction, and
2. an Appendix to the American Society of Mechanical Engineers (ASME) B-31 Piping Codes for the design of better performing buried pipelines in earthquakes, not just water pipelines.

The projects are being funded by the Federal Emergency Management Agency (FEMA) under a cooperative agreement with the American Society of Civil Engineers (ASCE). Both of these documents should be available in early 2001 and will be able to be obtained from ASCE. Contact Thomas McLane, tmclane@asce.org. For further information on ALA, go to - http://www.americanlifelinesalliance.org/

ABAG, the Association of Bay Area Governments, is the regional planning and services agency for the nine-county San Francisco Bay Area. The liquefaction hazard map information was last updated by ABAG in October 2003.

jbp 10/16/03

PROPOSED REVISIONS TO THE COASTAL ZONE LAND USE ORDINANCE TO RUN CONCURRENTLY WITH THE ESTERO AREA PLAN UPDATE
Public Hearing Draft, August 2003

ORDINANCE NO._____

AN ORDINANCE AMENDING TITLE 23 OF THE SAN LUIS OBISPO COUNTY CODE, THE COASTAL ZONE LAND USE ORDINANCE; SECTIONS 23.04.186, 23.05.050, 23.06.100, 23.06.106, 23.06.108 REGARDING WATER QUALITY AND DRAINAGE; SECTION 23.05.110 REGARDING ROADS AND BRIDGES; SECTIONS 23.04.200 AND 23.07.104 REGARDING ARCHAEOLOGICAL RESOURCES; SECTION 23.04.210 REGARDING VISUAL RESOURCES; SECTION 23.04.220 REGARDING ENERGY CONSERVATION; SECTION 23.04.440 REGARDING A COMMUNITY-BASED TDC PROGRAM FOR LOS OSOS; AND SECTIONS 23.01.043 AND 23.11.030 REGARDING APPEALS WITHIN UNMAPPED ENVIRONMENTALLY SENSITIVE HABITATS

The Board of Supervisors of the County of San Luis Obispo ordains as follows:

SECTION 1: Chapter 23.04 of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **adding new section 23.04.200** to read as follows:

23.04.200 - Protection of Archaeological Resources Not Within the Archaeologically Sensitive Areas Combining Designation: All development applications that propose development that is not located within the Archaeologically Sensitive Areas combining designation and that meets the following location criteria shall be subject to the standards for the Archaeologically Sensitive Areas combining designation in Chapter 23.07: development that is either within 100 feet of the bank of a coastal stream (as defined in the Coastal Zone Land Use Ordinance), or development that is within 300 feet of such stream where the slope of the site is less than 10 percent.

This amendment treats areas close to streams--that are known to have a higher likelihood of containing archaeological resources--as though they were in the Archaeologically Sensitive combining designation, without actually mapping them. Such areas would be subject to the AS combining designation standards in Chapter 23.07, as revised in the following section. In practice, new development in such areas is typically required to have an archaeological surface survey in connection with environmental review, where required by CEQA.

SECTION 2: Section 23.07.104c [Archaeologically Sensitive Areas: When a mitigation plan is required] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby **amended** to read as follows:

b. When a mitigation plan is required. If the preliminary site survey determines that proposed development may have significant effects on existing, known or suspected archaeological resources, a plan for mitigation shall be prepared by the archaeologist. The purpose of the plan is to protect the resource. The plan may recommend the need for further study, subsurface testing, monitoring during construction activities, project redesign, or other actions to mitigate the impacts on the resource. Highest priority shall be given to avoiding disturbance of sensitive resources. Lower priority mitigation measures may include use of fill to cap the sensitive resources. As a last resort, the review authority may permit excavation and recovery of those resources. The mitigation plan shall be submitted to and approved by the Environmental Coordinator, and considered in the evaluation of the development request by the review authority ~~applicable approval body~~.

This amendment states the priorities for mitigation of impacts to archaeological resources, with highest priority given to avoidance. This amendment codifies what is already current practice that is consistent with the CEQA Guidelines.

SECTION 3: Chapter 23.04 of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **adding new section 23.04.210** to read as follows:

23.04.210 - Visual Resources:

The following standards apply within Critical Viewsheds, Scenic Corridors and Sensitive Resource Area (SRA) combining designations that are intended to protect visual resources, as identified in this title, the Official Maps, Part III of the Land Use Element, or the area plans of the Local Coastal Plan.

a. Applicability of standards. The following standards apply to proposed land divisions and residential and residential accessory structures (including water tanks), agricultural and agricultural accessory structures, commercial structures, pipelines and transmission lines, public utility facilities, communications facilities, and access roads that are required by the Coastal Zone Land Use Ordinance to have a land use permit, except that the following are exempt from some or all of these standards:

(1) Agricultural accessory structures that are 600 square feet or less in area.

(2) Project not visible. An exemption from the standards in the following subsections c(1), (2), (4), and (5) may be granted if documentation is provided demonstrating that the proposed structures and access roads will not be visible from any of the roads specified in the applicable area plan planning area standards for Critical Viewsheds, Scenic Corridors or SRA's

that are intended to protect visual resources. Such documentation shall at a minimum provide topographic and building elevations with preliminary grading and building plans. An exemption from the standard in subsection c(6) may be granted if the preceding documentation is provided, and if open space preservation within the Critical Viewshed or SRA is not otherwise needed to protect sensitive habitat or watershed, as identified in the area plans.

b. Permit requirement. Minor Use Permit approval, unless Development Plan approval is otherwise required by this title or planning area standards of the area plans. The land use permit or land division application shall include the following:

(1) A landscaping plan and a visual analysis that is prepared by a licensed architect, a licensed landscape architect or other qualified person acceptable to the Director of Planning and Building. The landscaping plan and visual analysis shall be used to determine compliance with the following standards.

c. Standards for Critical Viewsheds and SRAs for protection of visual resources. The following standards apply within areas identified as Critical Viewsheds or SRAs in the area plans for protection of visual resources.

(1) Location of development. Locate development, including accessory structures, water tanks and access roads, in the least visible portion of the site as viewed from any of the applicable roads or highways described in the applicable planning area standards in the area plans, consistent with protection of other resources. Visible or partially visible development locations shall only be considered if no non-visible development locations are identified, or if such locations would be more environmentally damaging. Visible or partially visible development locations may be approved where visual effects are reduced to an insignificant level, as determined by the review authority. Use topographic features first and vegetation second to screen development from public view.

(2) Building visibility. Minimize building height and mass by using low-profile design where applicable, including partially sinking structures below grade. Minimize the visibility of buildings, including water tanks, by using colors to harmonize with the surrounding environment.

(3) Ridgetop development. Locate structures so that they are not silhouetted against the sky as viewed from the Morro Bay estuary and applicable roads or highways described in the applicable planning area standards in the area plans, unless compliance with this standard is infeasible or results in more environmental damage than an alternative.

(4) **Landscaping for hillside and ridgetop development.** Provide at least 80 percent screening of structures at plant maturity using native or drought-tolerant vegetation (no invasive species) as seen from applicable roads or highways described in the applicable planning area standards in the area plans, but without obstructing major public views (e.g., screening should occur at the building site rather than along a public road). Maximize use of evergreen trees and large-growing shrubs that have shapes similar to existing native vegetation. Alternatives to such screening may be approved if visual effects are otherwise reduced to an insignificant level through use of topographic features or design of structures. Provisions shall be made to maintain and guarantee the survival of required landscape screening for a period of at least five years.

(5) **Residential land divisions - cluster requirement.** Residential land divisions and their building sites shall be clustered in accordance with Chapter 23.04 or otherwise concentrated in order to protect the visual resources as identified in the area plans.

(6) **Open space preservation.** Pursuant to the purpose of the Critical Viewshed or SRA to protect significant visual resources, open space preservation is a compatible measure to support the approval of new development. Approval of an application for any land division, Minor Use Permit or Development Plan (excluding any agricultural accessory building) is contingent upon the applicant executing an agreement with the county to maintain in open space use appropriate portions of the site within the Critical Viewshed or SRA (for visual protection) that are not intended for development. Guarantee of open space preservation may be in the form of public purchase, agreements, easements controls or other appropriate instrument, provided that such guarantee agreements are not to grant public access unless acceptable to the property owner.

d. **Standards for scenic corridors.** The following standards apply within areas identified as Scenic Corridors in the area plans for protection of visual resources.

(1) **Setback.** Where possible, residential buildings, residential accessory structures and agricultural accessory structures shall be set back 100 feet from the edge of the right-of-way of the road along which the Scenic Corridor is established in the area plans, or a distance as otherwise specified in the area plan planning area standards. If there is no feasible development area outside of this setback, the project shall be located on the rear half of the property and shall provide a landscaping screen of moderately fast-growing, drought-tolerant plant material to provide 80 percent view coverage at plant maturity at the building site (not along the public road). A landscaping plan in accordance with the requirements of Chapter 23.04 shall be provided at the time of building permit application submittal.

(2) Signs. Locate signs that are required to have a land use permit, especially freestanding signs, so that they do not interfere with vistas from the road along which the Scenic Corridor is established in the area plans.

This amendment establishes a consistent set of standards for projects located within visually sensitive areas, using language taken from existing standards in the area plans. This approach will eliminate the need to establish new, separate visual standards in each area plan and should help eliminate the variations in such standards from one area plan to another.

SECTION 4: Chapter 23.04 of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **adding new section 23.04.220** to read as follows:

23.04.220 - Energy Conservation, Including Design for Solar Orientation: The policies and guidelines for designing compact communities and energy efficient projects described in the Energy Element of the County General Plan shall be consulted for new land divisions and development.

This amendment encourages project proponents to consider incorporating into project design the energy conservation measures in the Energy Element; however, the amendment in itself does not require any specific measures.

SECTION 5.: Section 23.04.440 of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **revising and recodifying as subsection a**, and by **adding new subsection b**, to read as follows:

23.04.440 Community-Based Transfer of Development Credits Programs ~~- Cambria~~.

a. Cambria.

The purpose of this subsection is to implement portions of the Cambria/Lodge Hill Community-based Transfer of Development Credits Program (TDC) by providing a procedure to allow simple transfers within the Lodge Hill area of the community of Cambria. Consistent with applicable planning area programs and standards of the Land Use Element, the objective of this subsection is to reduce potential buildout in sensitive areas of Lodge Hill called “Special Project Areas.” Through transfer of development credits, allowable building area (expressed in square footage) for lots within a special project area may be transferred to more suitable sites within Lodge Hill. A lot from which development credits have been transferred is "retired," and loses its building potential through recordation of a permanent conservation easement or other document. A residence on a “receiver” lot may thus be developed with larger dwellings than would otherwise be allowed by planning area standards.

(1) ~~a.~~ Where allowed. Development credit transfers shall occur only on parcels located within the Lodge Hill area (east and west) as defined by Figure 3,

Cambria Urban Area, Part II of the Land Use Element. Lots being retired for purposes of a transfer shall be located within a special project area as shown on Figure 3. In no case shall a development credit be transferred to a building site within a special project area from outside the area. Lots within a special project area may qualify for additional dwelling square footage only by retiring lots(s) within a special project area.

(2) ~~b.~~ **Permit Requirement.** Minor Use Permit for the proposed dwelling and site receiving the additional allowed square footage. No permit requirement for the lot to be retired into open space.

(3) ~~c.~~ **Required findings.** The review authority ~~Planning Director or applicable appeal body~~ shall not approve a Minor Use Permit for a residence to be constructed with additional square footage gained through TDC until the following findings have been made:

i. ~~(1)~~ Adequate instruments have been executed to assure that lot(s) to be retired will remain in permanent open space and that no development will occur; and

ii. ~~(2)~~ The "receiver" site can accommodate the proposed scale and intensity of development without the need for a variance (23.01.045), exception to height limitations (23.04.124b) or modification to parking standards (23.04.162h); and

iii. ~~(3)~~ The circumstances of the transfer are consistent with the purpose and intent of the applicable planning area programs and standards regarding transfer of development credits.

(4) ~~d.~~ **Eligible purchasers of TDC's.** Owners of small lots within Lodge Hill may be allowed to construct a larger residence than would otherwise be allowed by the planning area standards of the Land Use Element through participation in the TDC program. Larger residences may be constructed on a "receiver" lot through purchase of available square footage from a non-profit corporation organized for conservation purposes.

(5) ~~e.~~ **Application contents.** In addition to meeting the application contents of section 22.02.033 (Minor Use Permit), an applicant proposing a TDC shall submit evidence that a preliminary agreement has been reached between the property owners and a non-profit corporation organized for conservation purposes approved by the Planning Director, including the following:

i. ~~(1)~~ The location of the lot(s) to be retired;

ii. ~~(2)~~ The size and approximate slope of both lots to be retired and lot(s) to receive additional square footage;

iii. ~~(3)~~ The method of permanent disposition of fee title of the lot(s) to be retired;

iv. ~~(4)~~ The type of conservation easement, deed restriction or other instrument utilized to guarantee the permanent open space of the lots(s) to be retired.

(6) ~~f.~~ **Participation of a non-profit corporation required.** A TDC shall not be approved unless a non-profit corporation or public agency, organized for conservation purposes and approved by the Planning Director, participates in the TDC process. The role of the non-profit corporation may include public information and TDC program development, a source of available square footage for purchase, recordation of easements, deed restrictions or other documents, and may be responsible for final disposition of lots to be retired.

b. Los Osos.

The purpose of this subsection is to implement portions of the Los Osos Community-based Transfer of Development Credits (TDC) Program by providing a procedure to allow simple transfers between sending sites (TDCS) and receiving sites (TDCR) identified in the Estero Area Plan of the Land Use Element and Local Coastal Plan. Consistent with applicable planning area programs and standards in the Estero Area Plan, the objectives of this subsection are to help establish a greenbelt around Los Osos, clearly define the urban edge of the community, prevent urban sprawl, discourage conversion of agricultural lands, protect unique and sensitive habitat, and protect scenic qualities. Through transfer of development credits, all or a portion of the allowable density on an identified sending site may be transferred to receiving sites that are suitable for higher intensity development. A sending site or portion thereof from which development credits have been transferred is "retired," and loses its building potential through recordation of a permanent conservation easement or other document. A receiving site to which development credits have been transferred may thus be developed at a higher density or intensity than would otherwise be allowable by the Local Coastal Program.

(1) **Where allowed.** Development credits may be transferred only to properties located within identified transfer of development credits receiving sites (TDCR) shown in the maps and/or described in the text of the Estero Area Plan of the Land Use Element and Local Coastal Plan. Properties within identified TDCRs may qualify for additional density or intensity of development only when retiring properties within identified transfer of development credits sending sites (TDCS) as shown in the maps and/or described in the text of the Estero Area Plan.

(2) **Required findings.** The review authority shall not approve a land use permit or tentative map that proposes additional density or intensity of development through use of TDCs until the following findings are made:

i. Adequate instruments have been executed to assure that all property to be retired will permanently remain in open space or in agricultural uses consistent with the Coastal Zone Framework for Planning, Land Use Element and Local Coastal Plan, and that no other development will occur.

ii. The circumstances of the transfer are consistent with the purpose and intent of the applicable planning area programs and standards regarding transfer of development credits.

(3) **Eligible purchasers of TDC's.** Owners of properties within identified TDCRs may be allowed to develop at higher densities or intensities than would otherwise be allowable by the Local Coastal Program through participation in the Los Osos Community-based TDC program. Higher density or intensity development may be developed on a TDCR site by purchasing development credits from an identified TDCS site from a non-profit corporation or public agency organized for conservation purposes and approved by the Planning Director.

(4) **Application contents.** In addition to meeting the application contents of Chapter 23.02 of the Coastal Zone Land Use Ordinance, an applicant proposing TDCs shall submit evidence that a preliminary agreement has been reached between the property owners and a non-profit corporation organized for conservation purposes and approved by the Planning Director, including the following:

i. The location of the property, or portion thereof, to be retired.

ii. The number of development credits that are to be retired, and the number of credits, if any, that will remain on the TDCS site.

iii. The method of permanent disposition of fee title of the property to be retired.

iv. The type of conservation easement, deed restriction or other instrument used to guarantee the permanent open space or agricultural use of the property to be retired.

(5) **Participation of a non-profit corporation required.** A TDC shall not be approved unless a non-profit corporation or public agency, organized for conservation purposes and approved by the Planning Director, participates in the TDC process. The non-profit corporation may provide public information; help develop the TDC program; purchase and sell development credits; record easements, deed restrictions or other documents; and

manage and otherwise be responsible for the final disposition of properties to be retired.

This amendment is needed to enable implementation of the community-based TDC program established as part of the Estero Area Plan update (in Chapters 6 and 7 of the draft Estero Area Plan).

SECTION 6.: Chapter 23.05 of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **adding new section 23.05.110** to read as follows:

23.05.110 - Road and Bridge Design, Construction and Maintenance:

Roads and bridges shall be designed, constructed and maintained to protect sensitive resources (such as aquatic habitat and scenic vistas) and prime agricultural soils to the maximum extent feasible; to minimize terrain disturbance, vegetation removal and disturbance of natural drainage courses; to avoid the need for shoreline protective devices; and to provide for bikeways and trails, consistent with the Circulation Element of the County General Plan. In addition, the following measures shall be implemented:

a. Contour slopes to blend in with adjacent natural topography

b. Replant graded areas with native vegetation

c. Include pollution prevention procedures in the operation and maintenance of roads and bridges to reduce pollution of surface waters

d. Apply fertilizers and nutrients at rates that establish and maintain vegetation without causing nutrient runoff to surface waters

e. Give preference to aerial crossings of watercourses

This amendment expands upon a planning area standard in the existing Estero Area Plan by applying the standards to bridges as well as to roads, and by protecting sensitive habitat and prime agricultural soils, as well as visual resources. Additional measures are also included, such as methods to prevent water pollution. This amendment is consistent with another proposed amendment in connection with Periodic Review implementation that would allow for better protection of Environmentally Sensitive Habitat Areas by examining alternatives to locations of permitted roads, bridges and other crossings.

SECTION 7.: Section 23.04.186d(3) [Landscape plan content: Planting plan] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby **amended by adding new subsection (ix)** to read as follows:

(ix) A note that fertilizers and nutrients are to be applied at rates that establish and maintain vegetation without causing nutrient runoff to surface waters.

SECTION 8.: Section 23.05.050b [Drainage Standards: Natural channels and runoff] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby **amended** to read as follows:

b. Natural channels and runoff. Proposed projects are to include design provisions to retain off-site natural drainage patterns and, when required, limit peak runoff to pre-development levels. To the maximum extent feasible, all drainage courses shall be retained in or enhanced to appear in a natural condition, without channelization for flood control.

SECTION 9.: Section 23.05.050 [Drainage Standards] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby **amended by revising subsection a** [design and construction]**, and by adding new subsections g, h and i** to read as follows (new subsections e and f regarding best management practices are proposed to be added through Periodic Review implementation):

a. Design and construction. Drainage systems and facilities subject to drainage plan review and approval that are to be located in existing or future public rights-of-way are to be designed and constructed as set forth in the County Engineering Department Standard Improvement Specifications and Drawings. Other systems and facilities subject to drainage plan review and approval are to be designed in accordance with good engineering practices. The design of drainage facilities in new land divisions and other new development subject to Minor Use Permit or Development Plan approval shall maximize groundwater recharge through on-site or communitywide stormwater infiltration measures. Examples of such measures include constructed wetlands, vegetated swales or filter strips, small percolation ponds, subsurface infiltration basins, infiltration wells, and recharge basins. Where possible, recharge basins shall be designed to be available for recreational use.

g. Sensitive habitat and groundwater protection. Runoff from roads and development shall not adversely affect sensitive habitat, groundwater resources and downstream areas, and shall be treated to remove floatable trash, heavy metals and chemical pollutants as necessary prior to discharge into surface or groundwater.

h. Impervious surfaces. New development shall be designed to minimize the amount of impervious surfaces.

SECTION 10.: Section 23.06.100 [Water Quality] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **adding new section 23.06.104** to read as follows:

23.06.104 - Municipal Well-head Protection: Referrals:

The purpose of this section is to protect groundwater resources from contamination by proposed development.

Minor Use Permit and Development Plan applications that propose uses within one mile of a municipal well (locations of municipal wells may be shown in the area plans) that have the potential to release toxic or hazardous materials (e.g. gas stations, businesses that handle hazardous wastes) shall be referred to the County Environmental Health Division for review and appropriate recommended measures that assure protection of water quality. Recommended measures may include, but are not limited to the following:

a. Determining the extent of areas that contribute water to municipal wells, and making further recommendations as appropriate

b. Relocating proposed uses relative to municipal wells, especially where such uses involve the manufacture, storage or handling of hazardous materials

c. Concentrating or clustering development relative to the location of municipal wells

d. Reducing the density or intensity of proposed uses

e. Limiting the amounts of potential contaminants that may be stored or handled

SECTION 11.: Section 23.06.100 [Water Quality] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **adding new section 23.06.106** to read as follows:

23.06.106 - Wastewater: On-site Sewage Disposal:

Wastewater from on-site sewage disposal systems shall not adversely affect groundwater resources or sensitive habitat.

SECTION 12.: Section 23.06.100 [Water Quality] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby amended by **adding new section 23.06.108** to read as follows:

23.06.108 - Chemical Control:

Land use permit applications that require discretionary review for projects that have potential to release toxic or hazardous materials (e.g. gas stations, businesses that handle hazardous wastes) shall include measures, and where applicable, Best Management Practices that: a) minimize the amounts of potential contaminants that may be stored or handled; b) assure proper containment and c) prevent release of contaminants into the environment. These measures and practices shall be referred to the County Division of Environmental Health for review and for recommendations that shall be implemented through the land use permit.

In general, preceding Sections 7 through 12 modify existing standards and establish new standards in order to better manage drainage and protect water quality, groundwater recharge and sensitive habitat. These amendments respond to concerns expressed by the Coastal Commission staff about the need to address non-point source pollution from development activities. These standards are in addition to the standards requiring best management practices for residential and non-residential projects that are proposed to be implemented through the Periodic Review process.

SECTION 13.: Section 23.01.043c [Appeals to the Coastal Commission, Appealable Development] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby **amended** to read as follows:

c. Appealable development. As set forth in Public Resources Code Section 30603(a) and this title, an action ~~a decision~~ by the County on a permit application, including any Variance, Exception, or Adjustment granted, for any of the following projects may be appealed to the California Coastal Commission:

(1) Developments approved between the sea ~~ocean~~ and the first public road parallelling ~~to~~ the sea ~~ocean~~, or within 300 feet of the inland extent of any beach ~~(~~or of the mean high tide line of the ocean where there is no beach~~)~~, whichever is the greater distance, as shown on the adopted post-certification appeals maps.

(2) Approved developments not included in subsection c(1) of this section that are proposed to be located on tidelands, submerged lands, public trust lands, within 100 feet of any wetland, estuary, stream, or within 300 feet of the top of the seaward face of any coastal bluff, as shown on the adopted post-certification appeals maps.

(3) Developments approved in areas not ~~identified~~ included in subsections c(1) or c(2) ~~above~~ that are located in a Sensitive Coastal Resource Area, ~~as defined in Chapter 23.11 of this title,~~ which includes:

(i) Special marine and land habitat areas, wetlands, lagoons, and estuaries mapped and designated as Environmentally Sensitive Habitats (ESHA) in the Local Coastal Plan. Does not include resource areas determined by the County to be Unmapped ESHA.

(ii) Areas possessing significant recreational value, including any "V" (Visitor Serving designation) as shown in the Land Use Element and areas in or within 100 feet of any park or recreation area.

(iii) Highly scenic areas which are identified as Sensitive Resource Areas by the Land Use Element.

(iv) Archaeological sites referenced in the California Coastline and Recreation Plan or as designated by the State Historic Preservation Officer.

(v) Special Communities or Small-Scale Neighborhoods which are significant visitor destination areas as defined by Chapter 23.11 of this title.

(vi) Areas that provide existing coastal housing or recreational opportunities for low-and moderate income persons.

(vii) Areas where divisions of land could substantially impair or restrict coastal access.

(4) Any approved development not listed in Coastal Table O, Part I of the Land Use Element as a Principal Permitted (PP) Use.

(5) Any development that constitutes a Major Public Works Project or Major Energy Facility. "Major Public Works Project" or "Major Energy Facility" shall mean any proposed public works project or energy facility exceeding $100,000 in estimated construction cost, pursuant to Section 13012, Title 14 of the California Administrative Code.

The procedures established by Section 23.01.041c. (Rules of Interpretation) shall be used to resolve any questions regarding the location of development within a Sensitive Coastal Resource Area.

SECTION 14.: Section 23.11.030 [Coastal Zone Land Use Ordinance Definitions] of the Coastal Zone Land Use Ordinance, Title 23 of the San Luis Obispo County Code, is hereby **amended** to read as follows:

Environmentally Sensitive Habitat Area (Mapped ESHA). A type of Sensitive Resource Area where plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could easily be disturbed or degraded by human activities and development. They include wetlands, coastal streams and riparian vegetation, terrestrial and marine habitats and are mapped as Land Use

Element combining designations. Is the same as an Environmentally Sensitive Habitat.

Environmentally Sensitive Habitat Area (<u>Unmapped</u> ESHA). A type of Sensitive Resource Area where plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could easily be disturbed or degraded by human activities and development. They include, but are not limited to, known wetlands, coastal streams and riparian vegetation, terrestrial and marine habitats that may <u>not</u> be mapped as Land Use Element combining designations. The existence of Unmapped ESHA is determined by the County at or before the time of application acceptance and shall be based on the best available information. Unmapped ESHA includes but is not limited to:

1. Areas containing features or natural resources when identified by the County or County-approved expert as having equivalent characteristics and natural function as mapped other environmentally sensitive habitat areas;

2. Areas known to contain sensitive resources identified by appropriate resource protection agencies, such as the U.S. Fish and Wildlife Service and the State Department of Fish & Game;

3. Areas previously known to the County from environmental experts, documents or recognized studies as containing ESHA resources;

4. Other areas commonly known as habitat for species determined to be threatened, endangered, or otherwise needing protection.

The purpose of preceding Sections 13 and 14 is twofold. Section 14 adds a second type of ESHA that is usually unmapped or poorly defined on County LCP maps. Early recognition of the existence of ESHA, whether it is mapped or unmapped, is important for both proposed development and protection of the resources. This proposed change will allow for better identification and protection of Environmentally Sensitive Habitat Areas and bring the County's LCP into conformance with the Coastal Act.

Section 13 amends the Appeals section to make it clear that development proposed in an Unmapped ESHA is not appealable only because it is ESHA. However, it may be appealable for other reasons consistent with other LCP requirements.

SECTION 15.: That the Board of Supervisors has considered the initial study prepared and conducted with respect to the matter described above. The Board of Supervisors has, as a result of its consideration, and the evidence presented at the hearings on said matter, determined that the proposed negative declaration as heretofore prepared and filed as a result of the said initial study, is appropriate, and has been prepared and is hereby approved in accordance with the California Environmental Quality Act and the County's regulations implementing said Act. The Board of Supervisors, in adopting this ordinance, has taken into account and reviewed and considered the information contained in the negative declaration approved for this project and all comments that were received during the public hearing process. On the basis of the Initial Study and any comments received, there is no substantial evidence that the adoption of this ordinance will have a significant effect on the environment.

SECTION 16.: If any section, subsection, clause, phrase or portion of this ordinance is for any reason held to be invalid or unconstitutional by the decision of a court of competent jurisdiction, such decision shall not affect the validity or constitutionality of the remaining portion of this ordinance. The Board of Supervisors hereby declares that it would have passed this ordinance and each section, subsection, clause, phrase or portion thereof irrespective of the fact that any one or more sections, subsections, sentences, clauses, phrases or portions be declared invalid or unconstitutional.

SECTION 17.: This ordinance shall become operative only upon approval without any modifications by the California Coastal Commission and upon acknowledgment by the San Luis Obispo County Board of Supervisors of receipt of the Commission's resolution of certification.

SECTION 18.: This ordinance shall take effect and be in full force on and after 30 days from the date of its passage hereof. Before the expiration of 15 days after the adoption of this ordinance, it shall be published once in a newspaper of general circulation published in the County of San Luis Obispo, State of California, together with the names of the members of the Board of Supervisors voting for and against the ordinance.

INTRODUCED at a regular meeting of the Board of Supervisors held on the ____ day of _____, 2004, and PASSED AND ADOPTED by the Board of Supervisors of the County of San Luis Obispo, State of California, on the _____ day of _____, 2004, by the following roll call vote, to wit:

AYES:

NOES:

ABSENT:

ABSTAINING:

_____
Chairman of the Board of Supervisors,
County of San Luis Obispo,
State of California

ATTEST:

_____
County Clerk and Ex-Officio Clerk
of the Board of Supervisors
County of San Luis Obispo, State of California

[SEAL]

ORDINANCE CODE PROVISIONS APPROVED
AS TO FORM AND CODIFICATION:

JAMES B. LINDHOLM, JR.
County Counsel

By:_____
Deputy County Counsel

Dated:_____

Drinking Water Source Assessment and Protection Program (DWSAP)

PROGRAM DOCUMENT - January 1999

Section 8.0
Vulnerability of Drinking Water Sources to Contamination

After the initial inventory of Possible Contaminating Activities (PCAs) has been completed (Section 7.0), a vulnerability analysis is conducted to determine the types of PCAs to which the drinking water source is most vulnerable by prioritizing the list of activities identified in the inventory. The analysis factors in the source and/or site characteristics that may affect the vulnerability of the source to contamination from the types of PCAs identified in the inventory.

8.1 Definition

Vulnerability: A determination of the most significant threats to the quality of the water supply that takes into account the physical barrier effectiveness of the drinking water source. The vulnerability determination also considers the type and proximity to the water supply of activities that could release contaminants.

Vulnerability, as defined in the DWSAP Program, is consistent with existing California regulations (see Section 8.4).

8.2 Vulnerability Analysis Procedures

The vulnerability analysis evaluates the types of PCAs identified in the inventory within the context of the characteristics of the source and its site. The first step in the analysis is to determine the Physical Barrier Effectiveness (PBE) for the drinking water source. The PBE can be determined using site-specific information on hydrogeology, hydrology and soils. Additional information is required depending upon whether the source is ground water or surface water.

8.2.1 Drinking Water Source and Site Characteristics

8.2.1.1 Drinking Water Source Information

The information needed to determine the Physical Barrier Effectiveness should be compiled using readily available data and reports. A minimum level of information is necessary to make the initial determination, but additional information may be useful in refining the determination.

For surface water sources, Appendix C shows the minimum water body and watershed information necessary to determine Physical Barrier Effectiveness. Most of this information can be found in the Watershed Sanitary Survey for the source.

For ground water sources, the minimum information necessary to determine Physical Barrier Effectiveness is shown in Appendix J. The information to be collected should be available from well

logs, soil survey maps, some general knowledge of the hydrogeology of the area, and well operation information.

8.2.1.2 Determination of Physical Barrier Effectiveness

The Physical Barrier Effectiveness is essentially an estimate of the ability of the natural geologic materials, hydraulic conditions, and construction features of the well or intake to prevent the movement of contaminants to the drinking water source.

A qualitative rating of low, moderate or high Physical Barrier Effectiveness (PBE), based on the drinking water source and site characteristics, is determined for each source. A simple approach to determining PBE for surface water is shown in Appendix C, and for ground water in Appendix J. In the DWSAP approach, the reviewer collects some basic information on the water body and watershed for surface water, and on the drinking water source and aquifer for ground water. This information is then evaluated with parameters that indicate the relative effectiveness of the source and site in preventing the migration of contaminants to the water supply.

In general, the intent of the Physical Barrier Effectiveness determination is to highlight the sources that have "high" or "low" effectiveness. Most sources will have "moderate" PBE. A more detailed review of the Physical Barrier Effectiveness at a site can be done during the development of a local source water protection program (see Section 11.0).

Surface Water

For surface water, the PBE evaluation considers several parameters including the size of, and detention time in, the reservoir, topography, geology, soils, vegetation, precipitation and ground water recharge. The size of the watershed is also important to consider, in terms of its potential for dilution or retardation of contaminants.

As shown in Appendix C, in order to get a high PBE ranking, all the parameters for a source must have values that indicate an effective barrier. For example, a source with a high PBE would be in flat terrain, with low precipitation and non-erosive soils covered by grassland.

A source is considered to have low PBE (i.e. high potential for contamination), if any of the parameters have values that do not indicate an effective barrier. For example, a source would be considered to have a low PBE if the watershed has steep slopes or if the soils are erodible or have high runoff potential.

For surface water, all sources that do not clearly have a low or high PBE are considered to have a moderate PBE. To be conservative (i.e., health protective), if any of the parameters is unknown, the drinking water source is considered to have low physical barrier effectiveness.

Ground Water

For ground water, the evaluation of Physical Barrier Effectiveness first considers the degree of confinement of the aquifer. An aquifer is classified as confined or unconfined (which includes semi-confined, leaky, and unknown). Detailed review is necessary to determine that an aquifer is confined. Table 6-1 lists indicators to consider in determining the presence or degree of confinement of an aquifer. In general, DHS will assume that an aquifer is unconfined unless detailed hydrogeologic information is available that clearly indicates that the aquifer is confined. Fractured rock aquifers, for purposes of the PBE analysis, are included in the unconfined aquifers, due to the complexity of their flow patterns.

PBE of Confined Aquifers

Confined aquifers generally are considered highly effective in preventing the migration of contaminants. However, the PBE may be diminished if abandoned or improperly destroyed wells are present that corrupt the integrity of the confining layer. The PBE may be improved if the hydraulic head in the confined aquifer is higher than the hydraulic head of aquifers above (i.e., the well exists under artesian conditions). The construction of the well can impact the effectiveness in retarding contaminants, particularly the presence of a properly constructed sanitary seal.

PBE of Unconfined Aquifers

For aquifers that are unconfined, semi-confined or of unknown confinement, the PBE evaluation next considers the soil materials in the aquifer. Wells in fractured rock are always considered to have low PBE due to the high transport velocities that can occur within fractures. Sources in porous media that have a thick continuous layer of clay above the water table have more effective barriers, similar to confined aquifers.

Abandoned or improperly destroyed wells within the protection zones for a source can decrease the effectiveness of the barrier. Because of the prevalence of abandoned and improperly destroyed wells, and the difficulty of locating them, they are considered to decrease the effectiveness of all ground water sources unless their absence can be assured.

In unconfined aquifers, water level conditions of a well can impact the likelihood that contaminants may be drawn to the well. Greater depths to ground water are more effective at preventing contamination. Wells with high production rates, short screened intervals and perforations located close to the top of the water table are more likely to pull contaminants towards the well.

As with unconfined aquifers, the construction of the well in a confined aquifer can impact its effectiveness in retarding contaminants, particularly the presence of a properly constructed sanitary seal.

The procedures for determining PBE for ground water use the checklist in Appendix J. A ground water source is assigned points for each parameter on the Physical Barrier Effectiveness checklist. The points are totaled to arrive at a PBE score for the source, ranging from a low of 0 points to a high of 100 points. The PBE points in themselves are not a quantitative value; rather they are used to determine the overall PBE rating for the source: low, moderate or high.

Physical Barrier Effectiveness

Score Interpretation

Point Total	PBE
0 to 35	Low (includes all sources in fractured rock)
36 to 69	Moderate
70 to 100	High

Notes on Physical Barrier Effectiveness checklist for ground water:

- The highest score a source in a confined aquifer can get is 100 (High PBE). The lowest score a source in a confined aquifer can get is 40 (Moderate PBE).

- The highest score a source in an unconfined aquifer can get is 70 (High PBE). Without having a clay layer 25’ thick, the highest score for a source in an unconfined aquifer is 60 (Moderate PBE).

- The only sources that can get High PBE are those in confined aquifers, and those in unconfined aquifers with a clay layer, with no abandoned or improperly destroyed wells in the protection zones.

- All sources in fractured rock are considered to have Low PBE.

8.2.2 Modifying the Risk Ranking for a PCA

As described in Section 7.0, the PCA inventory includes a ranking of the potential risk or threat of contamination to a drinking water source for each type of PCA. In the inventory, activities that are considered to have a high potential for pollution of drinking water sources are designated "very high" or ‘high" risk. Other activities having lower potential for drinking water pollution are designated "moderate" or "low" risk.

The risk ranking provides a simple approach to comparing the relative risk of types of PCAs. The risk rankings are based on the general nature of the activities and the contaminants associated with them (refer to Table 7-2), not on the density (number of facilities) or facility-specific information, such as management practices.

Comments were received regarding the ability to modify the risk ranking for an individual facility for a type of PCA. The DWSAP program is intended to be a simple, first-cut screening tool. Further detail, such as modifying the risk ranking of types of PCAs (Appendix E or L), is an optional part of the minimum drinking water source assessment. Evaluation of site-specific information may best be performed during the development of a local protection program (see Section 11.0).

8.2.3 Determination of Vulnerability

DHS has developed a simple approach to substitute for a detailed vulnerability determination. The vulnerability analysis uses the PCA inventory and the Physical Barrier Effectiveness determination to prioritize the list of types of PCAs in order to determine to which the drinking water source is most vulnerable.

The vulnerability ranking process is shown in Appendix F for surface water sources and Appendix K for ground water sources. The process involves reviewing each type of PCA identified in the inventory (and those types of PCAs whose presence is unknown) and assigning points based on the risk ranking of the type of PCA, the zone in which it occurs, and the Physical Barrier Effectiveness of the drinking water source. The points are added together, and the types of PCAs are prioritized according to points from highest to lowest, with the highest points representing the types of PCAs to which the source is most vulnerable. Finally, a cutoff point is identified, and the source is not considered vulnerable to types of PCAs with points below the cutoff.

As with the PBE scores, the vulnerability points in and of themselves do not have a quantitative value. Rather, the points are used to relatively rank the types of PCAs for an individual source. The ranking is intended as a preliminary tool to facilitate local source water protection programs that are site-specific.

The steps in the vulnerability ranking are listed below. The points for each element and the process for adding the points and assessing the relative vulnerability can be found following the steps.

1. Determine if any contaminants have been detected in the water supply (the information collected for use in the Consumer Confidence Report may be used for this purpose).

2. Determine, to the extent practical, the types of PCAs associated with detected contaminants.

3. For each type of PCA identified as existing in the protection zone(s), or as unknown, determine the number of points for the associated risk ranking.

4. For each type of PCA, determine the zone in which it occurs and add the points associated with that zone. If that type of PCA exists within more than one zone, repeat the process for each zone.

5. For each drinking water source, determine the Physical Barrier Effectiveness (PBE) and add the points associated with that PBE (these points are for Low, Moderate and High PBE as shown below).

6. Prioritize the types of PCAs by the vulnerability points, from the most points to the least.

7. The drinking water source is vulnerable to all types of PCAs with vulnerability points above the cutoff. Refer to the appropriate Vulnerability Matrix below.

8. The drinking water source is most vulnerable to PCA types with the highest vulnerability points, and to those PCA types associated with a contaminant detected in the water source, regardless of the vulnerability points.

9. The drinking water source is considered vulnerable to types of PCAs whose existence is Unknown, if the vulnerability points are equal to or greater than the cutoff.

Points for Vulnerability Analysis

PCA Risk Ranking Points:

Very High	7
High	5
Moderate	3
Low	1

Zone Points:

Surface Water (Zones defined)		Surface Water (Zones not defined)		Ground Water	
Zone A	= 5	Watershed	= 5	Zone A	= 5
Zone B	= 3	.		Zone B5	= 3

Remainder of Watershed	= 1	.		Zone B10	= 1
Unknown	= 0	Unknown	= 0	Unknown	= 0

Physical Barrier Effectiveness points:

Low	5
Moderate	3
High	1

Vulnerability Matrix for SURFACE WATER SOURCES

The cutoff point for vulnerability is **11**. The drinking water source is considered Vulnerable to all PCAs with Vulnerability Score greater than or equal to **11** (shaded boxes).

PCA points	**Zone points**		**PCA + Zone points**	**PBE Points**			**Vulnerability Score** **PCA + Zone + PBE points**		
Risk Ranking	Zones Defined	Zones Not Defined	.	Low	Med	High	PBE Low	PBE Med	PBE High
VH (7)	A (5)	Watershed (5)	12	5	3	1	17	15	13
VH (7)	B (3)	.	10	5	3	1	15	13	11
VH (7)	Watershed (1)	.	8	5	3	1	13	11	9
VH (7)	Unknown (0) *	Unknown (0)*	7	5	3	1	12	10	8
.	.	.	.	.	.	.	.	.	.
H (5)	A (5)	Watershed (5)	10	5	3	1	15	13	11
H (5)	B (3)	.	8	5	3	1	11	9	7
H (5)	Watershed (1)	.	6	5	3	1	11	9	7
H (5)	Unknown (0) *	Unknown (0)*	5	5	3	1	10	8	6
.	.	.	.	.	.	.	.	.	.
M (3)	A (5)	Watershed (5)	8	5	3	1	13	11	9
M (3)	B (3)	.	6	5	3	1	11	9	7
M (3)	Watershed (1)	.	4	5	3	1	9	7	5
M (3)	Unknown (0) *	Unknown (0)*	3	5	3	1	8	6	4
.	.	.	.	.	.	.	.	.	.

L (1)	A (5)	Watershed (5)	6	5	3	1	11	9	7
L (1)	B (3)		4	5	3	1	9	7	5
L (1)	Watershed (1)		2	5	3	1	7	5	1
L (1)	Unknown (0) *	Unknown (0)*	1	5	3	1	6	4	

* Source is considered vulnerable to type of PCAs that are Unknown, if the Vulnerability Score is 11 or higher.

Vulnerability Matrix for GROUND WATER SOURCES

The cutoff point for vulnerability is **8**. The drinking water source is considered Vulnerable to all PCAs with Vulnerability Score greater than or equal to **8** (shaded boxes).

PCA points	**Zone points**	**PCA + Zone points**	**PBE Points**			**Vulnerability Score PCA + Zone + PBE points**		
Risk Ranking	A, B5, B10	.	Low	Med	High	PBE Low	PBE Med	PBE High
VH (7)	A (5)	12	5	3	1	17	15	13
VH (7)	B5 (3)	10	5	3	1	15	13	11
VH (7)	B10 (1)	8	5	3	1	13	11	9
VH (7)	Unknown (0) *	7	5	3	1	12	10	8
.	.	.	.	.	.	.	.	.
H (5)	A (5)	10	5	3	1	15	13	11
H (5)	B5 (3)	8	5	3	1	13	11	9
H (5)	B10 (1)	6	5	3	1	11	9	7
H (5)	Unknown (0) *	5	5	3	1	10	8	6
.	.	.	.	.	.	.	.	.
M (3)	A (5)	8	5	3	1	13	11	9
M (3)	B5 (3)	6	5	3	1	11	9	7
M (3)	B10 (1)	4	5	3	1	9	7	5
M (3)	Unknown (0) *	3	5	3	1	8	6	4
.	.	.	.	.	.	.	.	.
L (1)	A (5)	6	5	3	1	11	9	7
L (1)	B5 (3)	4	5	3	1	9	7	5
L (1)	B10 (1)	2	5	3	1	7	5	1
L (1)	Unknown (0) *	1	5	3	1	6	4	2

* Source is considered vulnerable to type of PCAs that are Unknown, if the Vulnerability Score is 8 or

higher.

8.3 Uses of Vulnerability Analyses

The prioritized list from the vulnerability analysis may be used by a water system in developing protection measures to address activities that are most significant to the water supply.

In addition, the prioritized list will be useful to DHS to determine drinking water sources that may be eligible for chemical monitoring relief.

The prioritized list may also be useful on a statewide basis in determining the types of activities that represent the greatest threats to drinking water supplies, their proximity to drinking water sources, and an estimate of their prevalence.

The PBE determination may be useful for a water system in comparing water sources to each other, and identifying the ones that are at greater risk. The PBE determination may be useful on a state-wide basis in determining areas where sources with high or low effectiveness may be concentrated.

8.4. Vulnerability Assessment Procedures in California Regulations

Existing California regulations detail the vulnerability assessment procedures required to obtain a waiver for monitoring certain organic and inorganic chemicals in drinking water supplies.

California Code of Regulations (CCR), Title 22, Chapter 15, Section 64432(l) addresses vulnerability waivers for cyanide:

> (l) A water system may be eligible for a waiver from the monitoring frequencies for cyanide specified in paragraph (b)(1) of this section without any prior monitoring if it is able to document that it is not vulnerable to cyanide contamination pursuant to the requirements in section 64445(d)(1) or (d)(2). *(See below).*

CCR, Title 22, Chapter 15, Section 64432.2 addresses vulnerability waivers for asbestos for ground water systems:

> The Department will determine the vulnerability of ground water sources on the basis of historical monitoring data and possible influence of serpentine formations.

CCR, Title 22, Chapter 15, Section 64445(d)(1) and (2) addresses waivers for organic chemicals based on use and susceptibility:

> (d) A water system may apply to the Department for a monitoring waiver for one or more of the organic chemicals on Table 64444-A in accordance with the following:
>
> > (1) A source may be eligible for a waiver if it can be documented that the chemical has not been previously used, manufactured, transported, stored, or disposed of within the watershed or zone of influence and therefore, that the source can be designated non-vulnerable.
> >
> > (2) If previous use of the chemical locally is unknown or the chemical is known to have been used previously and the source cannot be designated non-vulnerable pursuant to Paragraph (d)(1), it may still be eligible for a waiver

based on a review related to susceptibility to contamination. The application to the Department for a waiver based on susceptibility shall include the following:

(A) Previous monitoring results;
(B) user population characteristics;
(C) proximity to sources of contamination;
(D) surrounding land uses;
(E) degree of protection of the water source;
(F) environmental persistence and transport of the chemical in water, soil and air;
(G) elevated nitrate levels at the water supply source; and
(H) historical system operation and maintenance data including previous Departmental inspection results.

Home

From: "albarrow" <abarrow@sbcglobal.net>
To: "baynews" <news@thebaynews.com>
Cc: <abarrow@sbcglobal.net>
Sent: Tuesday, March 22, 2005 7:47 PM
Attach: CONFORMED FINAL INITIATIVE PETITION.doc
Subject: Initiative petition ballot measure

Hello Niel;
You said today you intend to write an article on the lawsuits, revocation, recal and Initiative. The initiative has yet to announced. Please use our press release.
Press releases are just that. My view is let the releasor release and get published, then you write an article with your spin separately. Otherwise your paper is all opinion and no news. You may see it in a different light. Reality is reality, but we will keep trying for the facts.The longer the community is deprived of the facts the longer the sewer will take. Lets move forward with the facts and put all the cards on ther table.
My 'umble opinion.Attached is the Initiative we are over halfway in two weeks.
Thank You,
Al Barrow C.A.S.E.

LAW OFFICES
BURKE, WILLIAMS & SORENSEN, LLP
611 WEST SIXTH STREET, SUITE 2500
LOS ANGELES, CALIFORNIA 90017-3102
Tel: (213) 236-0600
Fax: (213) 236-2700
www.bwslaw.com

INLAND EMPIRE OFFICE
3403 TENTH STREET, SUITE 300
RIVERSIDE, CALIFORNIA 92501-3629
Tel: (951) 788-0100
Fax: (951) 788-5785

ORANGE COUNTY OFFICE
5 PARK PLAZA, SUITE 1280
IRVINE, CALIFORNIA 92614-2547
Tel: (949) 863-3363
Fax: (949) 863-3350

SAN DIEGO OFFICE
701 "B" STREET, SUITE 1790
SAN DIEGO, CALIFORNIA 92101-8142
Tel: (619) 615-6672
Fax: (619) 615-6673

SAN JOSE OFFICE
96 NORTH THIRD STREET, SUITE 620
SAN JOSE, CALIFORNIA 95112-5572
Tel: (408) 299-0422
Fax: (408) 299-0429

VENTURA COUNTY OFFICE
2310 EAST PONDEROSA DRIVE, SUITE 25
CAMARILLO, CALIFORNIA 93010-4747
Tel: (805) 987-3468
Fax: (805) 482-9834

Writer's Direct Dial:
(213) 236-2719
sporter@bwslaw.com

OUR FILE NO:
4750-0001

March 23, 2005

Steve Monowitz
Permit Supervisor
725 Front Street,
Suite 300
Santa Cruz, CA 95060-4508

Re: Permit Revocation Request For Coastal Development Application No. A-3-SLO-03-113

Dear Mr. Monowitz:

This communication outlines the appropriate legal standards for the California Coastal Commission ("Commission") to utilize when determining whether revoke the permit ("Permit") that was issued on August 11, 2004 on Application No. A-3-SLO-03-113.

This communication does not focus on the factual allegations relating to the Permit and the hearing, as those allegations are fully presented in the "Permit Revocation Request" prepared by the Los Osos Technical Task Force ("Revocation Request"); the February 23, 2005 rebuttal letter to Mr. Peter Douglas from Ms. Jana Zimmer ("Rebuttal Letter"); and additional comment letters that presumably are expected to have been or will be forwarded to your attention. Rather, this communication is intended to refute the legal assertions made in the Rebuttal Letter, and to provide a more accurate summary of applicable law.

When the appropriate legal standards are applied to those facts previously or subsequently submitted, it should establish that the Permit should be revoked.

I. REVOCATION IS REQUIRED IF THREE PRONGS ARE SHOWN.

CCR Title 14 Division 5.5. Article 16, 13105(a) (the "Regulation") provides:

> Grounds for revocation of a permit shall be:
>
> Intentional inclusion of inaccurate, erroneous or incomplete information in connection with a coastal development permit application, where the commission finds that accurate and complete information would have caused the commission to require additional or different conditions on a permit or deny an application.[1]

Stated differently, all that the Commission must find to revoke the Permit is (1) the Commission was presented with incomplete, inaccurate or erroneous information; (2) the inclusion of this information was intentional; and (3) complete or accurate information would have caused the Commission to have issued at least one condition in a different manner, or have denied the application.

A. The Commission Was Presented With Incomplete, Inaccurate or Erroneous Information.

The first prong to establish grounds for revocation is that the Commission was presented with incomplete, inaccurate or erroneous information. Stated differently, this first prong is met if the commission was presented with either incorrect information, or a "half-truth."

1. There Is No Requirement That The Incomplete Or Incorrect Information Be Presented By A Particular Party.

The Regulation does not require that the incorrect information be submitted by any particular party. The only way to create a requirement of disclosure by a particular party would be to add words to the Regulation. Rather, the Regulation is silent as to who must have made the representations. Adding words to a regulation is prohibited. *Burden v. Snowden* (1992) 2 Cal.4th 556, 562 *modified*, 2 Cal.4th 758 ["Where the words of the statute are clear, we may not add to or alter them to accomplish a purpose that does not appear on the face of the statute or from the legislative history"]; *Lesher Communications, Inc. v. City of Walnut Creek* (1990) 52 Cal.3d 531, 543 (1990) [A court "may not add to the statute or rewrite it to conform to an assumed intent that is not apparent in its language."]. Rather, the Regulation was drafted in the passive voice to avoid any requirement of action by a particular party.

[1] Section 13105(b) provides the alternate ground for revocation of a permit: "Failure to comply with the notice provisions of Section 13054, where the views of the person(s) not notified were not otherwise made known to the commission and could have caused the commission to require additional or different conditions on a permit or deny an application."

And for good reason. Otherwise, individuals that support the issuance of the Permit other than the applicant could make bald faced lies to the Commission and hide behind a rule that says, "unless the factual inaccuracies were presented by the actual applicant, the Commission can do nothing." This cannot be the law, nor is it the law. The Commission must have, and does have, the power to revoke permits if they were issued on incomplete or inaccurate information.

Nevertheless, the Rebuttal Letter asserts that this is the law. The rules of regulatory construction prohibit adding non-existent words and phrases. *Craig v. City of Poway* (1994) 28 Cal.App.4th 319, 337 [The Legislature is presumed to have meant what it said and the plain meaning of the language will govern the interpretation of the statute]. Contrary to this rule of regulatory construction, in an attempt to add a requirement of a particular actor, the Rebuttal Letter states the first prong requires that the "**applicant** or its representative submitted the contested testimony or information" [emphasis in Rebuttal Letter]. The only requirement is that there *were* factual misstatements; it is irrelevant who made the incorrect statements.

2. <u>The Incomplete Or Incorrect Information Need Only Have Related To The Permit Application.</u>

Similarly, the Rebuttal Letter asserts "the allegations merely restate a difference of opinion as to need for and the impacts of the project, not that the information provided the Commission did not accurately reflect the project to be constructed." This statement suggests that the only relevant information is that which relates to the "project to be constructed" – the size, shape, and location of the proposed structure. This may have been an inadvertent suggestion, but is nevertheless an improper conclusion, as the plain wording of the Regulation directly contradicts any such limitation. The Regulation provides that for the information to be considered, it need only have been presented "in connection with a coastal development permit application." Stated differently, if the information was relevant, it is at issue. As such, the Commission may consider any information that is relevant – including paperwork that was filed with the application, the status of approvals, the status of regulatory procedures, etc. The question of whether there are factual inaccuracies is so broad as to include whether the permits were obtained, whether the project complies with the LCP, and anything else related to the Permit.

Simply, the first prong merely requires that sometime during the Permit proceedings the Commission was presented with incomplete[2], inaccurate or erroneous information.

[2] The MacMillan 1980 Legal Thesaurus lists twenty three synonyms to the word to the word "incomplete." The terms are "broken, defective, deficient, devoid, imperfect, inadequate, inchoate, insufficient, non-substantial (not sufficient), outstanding (unresolved), paltry, partial (part), partial (relating to apart), perfunctory, rudimentary, scarce."

B. The Information Must Have Been Intentionally Included.

The second prong is that the information was intentionally included.

1. There Is No Required Showing Of Bad Faith.

The Regulation does *not* state that there is a requirement of bad faith; rather, the Regulation merely requires that the information be included "intentionally." Stated differently, there is no requirement that the Commission determine that whoever presented the information intended the *effect* of the act (i.e. intended to mislead the Commission), rather, the only requirement is that whoever presented the information had to have intended to do the act (i.e. to have intended to state or type the sentence, prepare a chart as it appeared, or have made any other representation in the manner in which it appeared as opposed to a mere oversight or any other accidental inclusion of information).

This interpretation is consistent with Black's Law Dictionary (both the 7th & 8th editions) which provides:

> "An act is intentional when foreseen and desired by the doer, and this foresight and desire resulted in the act through the operation of the will."

Simply, for an act to be "intentional" the law requires only a desire to do the act – there is no need to have a desire to have the actual effects of the act.[3] In legal jargon, the *actus reus*, is different than the *mens rea*; the act is different than the intent.

Had the Regulation been intended to require an improper motive, then the Regulations would have said so. For example, Regulation could have been drafted so as to require revocation where there was "intentional inclusion of inaccurate, erroneous or incomplete information introduced for the purpose of misleading the Commission." The Regulation, however, does not say this or anything similar. Because words cannot be added to regulations, the regulations must be interpreted as drafted. *Burden v. Snowden*, *supra*, 2 Cal.4th 556, 562.

[3] Numerous other authorities support this distinction. For example, Webster's Ninth New Collegiate Dictionary defines intent as "the state of mind with which an act is done: volition." It further provides that a synonym for "intent" is "voluntary." Another example is from the criminal context. There an act is intentional, so long as it was not accidental; there is no duty to show any further intent, unless the statutes specifically so provides. *U.S. v. Fuller* 162 f.3d 256 (4th Cir. 1998). This is confirmed by the legal maxim *In criminalibus, voluntas reputabitur pro facto* (in criminal cases, the intent will be taken for the deed."

Again, there is good reason for this rule. The drafters of the Regulation ("Drafters") were justifiably concerned that if the Commission required a showing of improper purpose, purpose could rarely, if ever be shown. How could the Commission ever know the motive of people who drafted documents, especially when the creator of those documents may never have even appeared at the hearing?[4] The Commission could never with any certainty determine that someone acted with a nefarious purpose. The ultimate concern of the Drafters was to preserve the California Coast. If the Commission was misled – regardless of the reason – the Commission must be allowed to properly regulate the California Coast. As such, the Commission us it trapped by mere technicalities.[5]

Yet that is exactly what the Rebuttal Letter proposes. It provides, "there is no evidence of an intent, let alone a motivation, to include erroneous or incomplete information." This statement improperly implies that the Commission must first determine whether the facts were incorrect, and *also* whether there was an improper motive. This is not the case.

2. <u>The Best Means To Determine Whether Information Was Intentionally Included Is To Determine How Often the Statements Were Made.</u>

The best means for the Commission to determine whether a statement was incomplete and/or factually inaccurate is to determine how many times that improper statement or a similar such statement was made. If the statement was made only one time, and that statement contradicted numerous other statements made by the same speaker, then the first statement was likely an unintended misstatement. If, however, the statement was made on more that one occasion, then the Commission can reasonably infer that the actor intended to make that statement.

Of course, there can be no hard and fast rule as to exactly when it can be known whether a particular statement is correct. In some situations one factual assertion can be known to be intentionally made. This is why the Regulation was drafted how it was – with a slight ambiguity and enough flexibility for the Commission to determine for itself whether a statement was accidental. Had the Drafters wished there to be a "bright line," they would have the exact number of misstatements that was required. The Drafters instead opted for flexibility.

[4] This is not to suggest that those presenting incomplete information to the Commission did not have a motive for doing so. Numerous motives may exist, including: (1) the desire to avoid any potential fines to be imposed by water quality officials; (2) the desire to quickly complete the project before a replacement board of directors opts to terminate the project; (3) the desire to comply with one's boss who bases job performance based upon whether the project is approved. Rather, this is simply intended to state that there is no need to show any such motivation.
[5] Of course, there must be some finality to Commission decisions. That is why the three prongs were required.

At first blush, the Regulation does not appear to be clear as to exactly what is meant by "intentionally." On further examination, however, when applying general legal principles, it becomes clear that the second prong of the Regulation merely requires a showing that the presenter of the information intended to include the information in the presentation.

C. The Commission Would Have Either Issued Different Conditions Or Denied The Application.

The last prong is that the "accurate and complete information would have caused the Commission to require additional or different conditions on a permit or deny an application." In other words, the Commission must determine that the information would have affected its decision in some manner had the information been complete or accurate.

1. The Commission May Look To Later Events To Determine Whether The Commission Was Presented With Complete And Accurate Information.

The Rebuttal letter suggests that the Commission can never look to actions which took place after the hearing. This is an oversimplification. The only rule is that the Commission must determine whether the information presented at the hearing was incomplete or inaccurate at the time. This does not preclude the Commission from considering latter evidence to determine whether the information was correct or complete at the time.

The Regulation does not preclude the use of latter events to determine whether the past was correct. Again, for good reason. Otherwise, someone could lie to the Commission and the Commission could do nothing about it. If, for example, the Commission was told "tomorrow I will transfer $1 million to the City," and the transfer never occurred, but instead, three weeks thereafter, the individual transferred the money to a Swiss bank account and fled the country, the Commission should be able to determine based on that information alone that at the time that the statement was made, it was inaccurate – there was never any present intent to transfer the money. This rational conclusion is based entirely upon latter determined facts. Yet the Rebuttal Letter suggests that the Commission must ignore this information and conclude that the information it initially received was accurate. Because this legal interpretation of a regulation leads to absurd conclusions, the legal interpretation must be discarded. *Landrum v. Superior Court* (1981) 30 Cal.3d 1, 9 [courts are reluctant to attribute to the drafters of legislation an intent to create "an illogical or confusing scheme"].

Simply, the Commission *must* be permitted to look to future events; otherwise it could not fully determine the truth of the past events. When doing so, the Commission must determine whether it would have ruled differently. If the Commission would have issued, added, removed

or changed any conditions, or if it would have denied the Permit, the Commission must revoke the Permit.

II. ADDITIONAL CORRECTIONS

In addition to those comments mentioned above, there are two additional comments made in the Rebuttal Letter that should be corrected.

A. The Existence of a Court Case In No Way Removes The Commission's Duty to Respond.

First, the Rebuttal Letter argues that because there is an existent lawsuit in which it is alleged that the Commission violated the Coastal Act, that somehow the Commission is therefore absolved from determining the issue in the current instance. This is incorrect. The fact that a court of law will determine a somewhat related issue on a previous matter does not absolve the Commission from its statutory and regulatory duty to now determine whether the Permit should be revoked. This is particularly true because the Court must use different legal standards, and will analyze different issues than those discussed herein. In fact, if the Commission fails to rule as required, it would likely be subject to litigation wherein it would be alleged that the Commission's failure of analysis was contrary to law.

B. Neither Party Has The Burden of Proof.

Second, the Rebuttal Letter asserts that "Complainants have the burden to prove several separate elements." This can clearly be shown to not be the state of the law for various reasons. First, the Rebuttal Letter provides no authority that any party has the burden of proof. Second, 14 CCR 13108(d) provides only that Commission may revoke the permit if the Commission finds "that any of the grounds specified in [the Regulation] exist." 14 CCR 13108(d) does not require that either party meet some unspecified burden of proof. Third, the plain wording of the Regulation, too, does not provide that either party has the burden of proof. Last, pursuant to 14 CCR 13104, the Commission's Executive Director has standing to initiate proceedings. If the assertion was correct that the Complainants have the burden of proof, then 14 CCR 13104, or another similar regulation would state how the burden of proof is different in this situation where neither party requested revocation of the permit.

Simply, there is no authority for such a proposition. If indeed, there was some such requirement there would be at least a *scintilla* of evidence to support this proposition. Presumably, the authors of the Rebuttal Letter assumed that the *court* rules of burdens of proof applied in this *administrative* proceeding; but again, no authority is presented for such conclusion.

III. CONCLUSION

If the Commission finds that (1) the Commission was presented with incomplete, erroneous, or incorrect information; (2) the party intended to present this information to the Commission; and (3) the inclusion of proper information would have caused the Commission to have issued a different decision, then the Commission must revoke the Permit.

Very truly yours,

Scott E. Porter
for BURKE, WILLIAMS & SORENSEN, LLP

From: "albarrow" <abarrow@sbcglobal.net>
To: "Gail McPherson" <ronmcpherson@earthlink.net>; "Jim Tkah" <jimtk@charter.net>; "Lisa Schicker" <lisaschicker@charter.net>; <abarrow@sbcglobal.net>; <mshunter@charter.net>; <truehr@oboe.aix.calpoly.edu>; "Chuck Cesena" <clcesena@charter.net>; "Steven Senet" <stevensenet@yahoo.com>; "Julie Tacker" <windmilljt@sbcglobal.net>
Cc: <abarrow@sbcglobal.net>
Sent: Monday, December 06, 2004 6:29 PM
Attach: pipe slopes 2.doc
Subject: pipe slopes 2

Hello;
Recent articles say the Nipomo wastewater collection system manholes hand to be coated due to hyrogen sulfide deterioration of the concrete manhole system. The cost $750.000.00 was due to shallow slopes of 1/16 inch per foot. We estimate 2/3 of the proposed LOCSD system will have the same problem.
A water sample from a gas line excavation was taken from 4th and Pismo. Water was two feet from grade where LOCSD want a 18 foot deep gravity collection pipe. Three samples will be tested to human coliform bacteria. Next week results will be back from the lab.
A retired public works manager from Fresno and a nieghbor of mine took a look at the Gas company crew's excavation. If the excavation were 15 to 20 foot deep as planned it would be unsafe without a cage for the workers and the pressure could be so great as to make it impossible to hold the sides. He also noted Fresno uses pond treatment and hired a company for $120K to do chemical odor control. They treat for a million residents.
He is willing to meet with the technical task force.
Thank You,
Al Barrow C.A.S.E.

From: "shpaige" <shpaige@sbcglobal.net>
To: "abarrow" <abarrow@sbcglobal.net>
Sent: Thursday, June 14, 2007 8:32 AM
Attach: compiled comments.pdf
Subject: Re: Comment on Fine Screening: for LOWWAC: Al Barrow

Compiled Comments Attached:

> ----- Original Message -----
> **From:** abarrow
> **To:** Lisa Schicker ; Gail McPherson ; Steven Senet ; jimtk@charter.net ; steve paige ; slogordon@fix.net
> **Cc:** al barrow
> **Sent:** Wednesday, June 13, 2007 10:28 PM
> **Subject:** Comment on Fine Screening: for LOWWAC: Al Barrow
>
> Hello Committee:
> Here is my offering on Fine screening to the end of collection chapter. I included the entro letter to the BOS and exec summary as they impact the process.
>
> In general:
> The process is flawed in a number of ways and the cost numbers unjustified by data. The order of events makes it impossible for the ratepayer/voter to know what they are commmiting themselves to. The document needs to be divided into to portions of private and public financed elements which each has their own constraints not covered here. There is a lot of speculation as to constraints assumptions on STEP, like separate power service to the property, replacing all tanks etc.
> Several FATAL FLAWS are listed in my comments. Some ommissions were addressed for the Counties benefit. It is distressing that they will not meet Orenco's request to have an LOCSD rep at the meetings with Carrollo.We need Orenco's cost values and technical in this fine sreeening. That inflexibility may cost them the 218 vote.
> I ask for consensus on the STEP collection as prefferred method. I also would ask that you all support the Pond/Wetland treatment which complements the reuse by removing the human carbon (that will cause carcinogens when mixed with chlorine in water delivery systems) assuming reuse as drinking water. Anyway here is a page plus of comments:
>
> Here are some points on the Fine Screening by Carrollo Engineering.
>
> The first sentence deals with property owners wish to partner with the County as expressed by a 218 favorable vote. Including expensive technology and an unpopular project in that vote puts Tri-w on the table. Seems risky to the 218. They mention options not on the table that could be viable.
>
> Since this is a cost document the assumed values must be justified. STEP industry show cost 1/3 of Corollo's values they need to be included here as BOOT financed privately does not have the engineering and contingency costs added to these costs. $50 million is the project estimate given by Orenco. By owning the treatment project and billing the ratepayers the private investment is secured by the infrastructure. 50% of all public projects do not use SRF loan as the saving in low interest is eaten by the strings and red tape. An example is Golden State who goes to the private sector to finance new infrastructure. They mention Regional Water Solutions, which opens another can of worms that the AB2701 included possibly obligating us to Nacamiento water that has some mercury. They are confident that STEP/STEG will remain on the table.
>
> The range of costs, $134 million to $207 million are totally unaffordable and numbers justified by assumptions other industry analyst have disagreed with. Another FATAL FLAW.I have two contractor estimates that refute these numbers.

Both Daleo and Tidwell have estimated septic tank to Andre with potholing and paving do not exceed $12.5 million local contractors at prevailing wage scale.

Page ES-6 makes some serious assumptions: federal funding is available, no HCP or EIR delays and competitive bidding at present there is no guarantee for these assumptions That isn't going to happen. Another reason for a turnkey approach.

Table 1.1 needs to name the facultative ponds still in after fine screening. Is ADS, AIPS or Nelson in?

1.2.1 Seawater intrusion reversal can be accomplished outside of the project by reducing the lower aquifer draft in lieu of upper aquifer water with nitrate for residential landscape application. These expenses can be paid by new development starting with the schools and park. Purple pipe is encouraged and funded by DWR. See the 2003 white paper on reuse. (Our upper aquifer is replenished by septic effluent and classed as partial wastewater or we would not need a sewer.

1.2.2 Golden State has applied to CAPUC for rate increase to pay for infrastructure and treatment that will utilize the upper aquifer. How many ACY will that reduce the lower draft? This is an omission that needs attention.

1.3 Flow projections will not change constituent treatment requirements, with ponds it is not a big factor as with 24 hour in 24 out treatment train but that will effect disposal numbers.

FATAL FLAW "Properly installed bell-and-spigot…" will leak raw sewage into our drinking water aquifer which will soon be the upper aquifer as the lower aquifer is not recharging.

2.1 KEEP THE WATERS IN THE BASIN unless the water is not needed then it can be sprayed and disposed.

2.1.2 Lower aquifer is intruded and that portion is lost That is not necessarily so.

Upper aquifer water must be harvested to the point it does not leak into the bay.

Recharge must not have Phosphorus, which will clog soil pores. All treatments so far do not address this.] impact on reuse. Calcium treatment that is affordable can be used in combination with wetlands to remove phosphorus this so the treated effluent waters are safe.

2.3.2 Bullet 4 describes the cost per acre of grade II-III farmland as $40, 000.00 I think $10,000.00 is a more responsible number. Giacomozzi was $323,000.00 for 35 acres at one point. More inflated costs!

The case is correctly made that pumping the upper aquifer as landscape water is cheaper than piping effluent back to town and much safer.

Table 2.1 page 33

PERCOLATION PONDS AT BRODERSON: This was a project FATAL FLAW in 1997 SLO County plan

Urban wastewater reuse is a poor concept compared to upper zone nitrogen water for irrigation instead of drinking water. Less piping and much lower health risk on school and community center.

They represent over 40ACF reduction in saltwater intrusion on the school/park sites.

2.1.2 Sea water intrusion is not irreversible. Early-indicator signals of groundwater contamination: the case of seawater encroachment

FCGMA documents reversal of saltwater intrusion in Ventura County.
http://publicworks.countyofventura.org/fcgma/GMA%20Management%20Plan-Final%20051506x%20electronic%20v2.pdf see page 25 for reversal of saltwater intrusion. Grants from 319 USA were used, see page 75 reduction in seawater intrusion.

I recommend a cost benefit analysis for purple pipe in the reuse portion. And a note on septic INI if a tank can be retrofitted

in ground with sprayed epoxy, like manhole restoration it would only cost $700.00 per tank. saving replacement and removal and retirement costs Replacements could take place at the point of resale so as not to have the community dug up at once. Charlotte County did not replace any tanks. For Gordon's benefit they used a Tarriff document to gain access to private property i have a copy if you would like me to send it along. Tank need certification as per RWQCB3 requirements. If a tank is abandone it could be used to capture rain water and recharge through existing leech fields. (No waste)

The STEP collection works well with pond treatment with low biosolids production and lowest energy demand making the combination the most sustainable as the project goals state Many constraints and costs have been added to STEP by this document that are not supported by the STEP Industry data. I have screened out gravity due to the eventual leakage into the drinking water aquifer as they have admitted. One other FATAL FLAW is the seawater intrusion around the Bay where the deepest pipes will be trenched in. When saltwater enters the collection system then the treatment plant will require reverse osmosis and brine trucking to Ventura County will ensue as many as 60 trucks a day. The expense of these impacts was not added to the gravity cost as I recall $60,000.00 a day or an additional . Less hydrostatic pressure in the upper aquifer and less water volume may bring in saltwater into the upper aquifer. Please remember that sea water levels are predicted to rise making STEP low pressure safer.

Consensus:

Pond treatment/STEP collection and wetland reuse spray irrigation on grazing land moving to AG exchange as it is more widely accepted.

From: "Mike Saunders" <msaunders@orenco.com>
To: "'abarrow'" <abarrow@sbcglobal.net>
Cc: "'Bill Cagle'" <bcagle@orenco.com>
Sent: Friday, August 24, 2007 11:41 AM
Attach: Swimming%20in%20Sewage1.pdf
Subject: Sewer Paper

Al,

This is the paper that I referenced that may be of interest. Many interesting statistics.

Michael L. Saunders
National Accounts Leader
Orenco Systems, Inc.

msaunders@orenco.com

Office 1-800-348-9843 (Extension 443)
Cell 941-276-8586
Fax 941-764-6069

Visit our web site at www.orenco.com

EPA/600/R-01/034
December 2000

Exfiltration in Sewer Systems

by

Robert S. Amick, P.E.
Environmental Quality Management, Inc.
Cincinnati, Ohio 45240
and
Edward H. Burgess, P.E.
Camp, Dresser & McKee
Cincinnati, Ohio 45249

Order No. 8C-R551-NASX

Project Officer

Ariamalar Selvakumar, Ph.D., P.E.
National Risk Management Research Laboratory
Edison, New Jersey 08837

National Risk Management Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, Ohio 45268

Notice

The U.S. Environmental Protection Agency through its Office of Research and Development funded and managed the research described here under contract 8C-R551-NASX to Environmental Quality Management, Inc. It has been subjected to the Agency's peer and administrative review and has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Foreword

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory is the Agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threatens human health and the environment. The focus of the Laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems. NRMRL collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by: developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions; and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

E. Timothy Oppelt, Director
National Risk Management Research Laboratory

Abstract

This report was submitted in fulfillment of Order No. 8C-R551-NASX by Environmental Quality Management, Inc. and Camp, Dresser & McKee of Cincinnati, Ohio under the sponsorship of the United States Environmental Protection Agency. This report covers the period from September 1998 to February 2000 and work was completed in April 2000.

The study focused on the quantification of leakage of sanitary and industrial sewage from sanitary sewer pipes on a national basis. The method for estimating exfiltration amounts utilized groundwater table information to identify areas of the country where the hydraulic gradients of the sewage are typically positive, i.e., the sewage flow surface (within pipelines) is above the groundwater table. An examination of groundwater table elevations on a national basis reveals that the contiguous United States is comprised of groundwater regions (established by the U.S. Geological Survey) which are markedly different. Much of the northeastern, southeastern, and midwestern United States has relatively high groundwater tables that are higher than the sewage flow surface, resulting in inflow or infiltration. Conversely, a combination of relatively low groundwater tables and shallow sewers creates the potential for widespread exfiltration in communities located in the western United States.

This report presents information on typical sewer systems, identifies and assesses the factors that cause or probably cause exfiltration, presents commonly used and advanced corrective measures and their costs for dealing with exfiltration, identifies technology gaps, and recommends associated research needs and priorities. This report also examines urban exfiltration, including a case study of Albuquerque, New Mexico.

Contents

Figures

Tables

Acknowledgement

The contributions of several individuals are acknowledged and appreciated for the preparation of the project report. Dr. Ariamalar Selvakumar and Mr. Richard Field were the Project Officer and Technical Advisor, respectively for EPA's National Risk Management Research Laboratory (NRMRL), and contributed toward the review and preparation of the project report. Mr. Robert Amick, P.E., was the Project Manager for Environmental Quality Management, Inc. Mr. Edward Burgess, the Technical Manager for Camp, Dresser & McKee, was responsible for the quantification of exfiltration on a national level.

Chapter 1
Introduction

1.1 Background

Many municipalities throughout the United States have sewerage systems (separate and combined) that may experience exfiltration of untreated wastewater from both sanitary and combined sewers. Sanitary sewer systems are designed to collect and transport to wastewater treatment facilities the municipal and industrial wastewaters from residences, commercial buildings, industrial plants, and institutions, together with minor or insignificant quantities of ground water, storm water, and surface waters that inadvertently enter the system. Over the years, many of these systems have experienced major infrastructure deterioration due to inadequate preventive maintenance programs and insufficient planned system rehabilitation and replacement programs. These conditions have resulted in deteriorated pipes, manholes, and pump stations that allow sewage to exit the systems (exfiltration) and contaminate adjacent ground and surface waters, and/or enter storm sewers. Exfiltration is different from sanitary sewer overflows (SSOs). SSOs are overflows from sanitary sewer systems usually caused by infiltration and inflow (I/I) leading to surcharged pipe conditions. SSOs can be in the form of direct overflows to receiving water, street flooding, and basement flooding; whereas exfiltration is not necessarily caused by excess I/I and is merely caused by a leaking sewer from its inside to its surrounding outside.

Untreated sewage from exfiltration often contains high levels of suspended solids, pathogenic microorganisms, toxic pollutants, floatables, nutrients, oxygen-demanding organic compounds, oil and grease, and other pollutants. Exfiltration can result in discharges of pathogens into residential areas; cause exceedances of water quality standards (WQS) and/or pose risks to the health of the people living adjacent to the impacted streams, lakes, ground water, sanitary sewers, and storm sewers; threaten aquatic life and its habitat; and impair the use and enjoyment of the Nation's waterways.

1.2 Objectives

Although it is suspected that significant exfiltration of sewage from wastewater collection systems occurs nationally, there is little published evidence of the problem and no known attempts to quantify or evaluate it on a national basis. Accordingly, the objectives of this

study were to quantify through desk-top estimates the magnitude of the exfiltration problem in wastewater collection systems on a national basis; identify the factors that cause and contribute to the problem; and document the current approaches for correcting the problem, including costs. The resulting information was used to identify information and technology gaps and research priorities.

Chapter 2 identifies and qualitatively assesses the causative factors and health impacts of exfiltration; the methodology employed for quantification of exfiltration on a national scale is presented in Chapter 3; Chapter 4 presents corrective measures applicable to exfiltration; national magnitude of exfiltration and corrective measure costs results are presented in Chapter 5; and Chapter 6 identifies existing information/data gaps and makes recommendations for further research.

Chapter 2
Identification and Assessment of Causative Factors and Health/Environmental Impacts

2.1 Causative Factors

A search for publications regarding exfiltration of sewage from wastewater collection systems did not locate any exfiltration-specific discussion of unique/causative factors because most factors which cause inflow/infiltration are identical to those associated with exfiltration (i.e., they both occur through leaks in pipes, depending on the relative depth of the ground water).

Factors that contribute to exfiltration include:

- size of sewer lines
- age of sewer lines
- materials of construction (sewer pipe, point/fitting material, etc.)
- type and quality of construction (joints, fittings, bedding, backfill)
- depth of flow in the sewer

Geological conditions that contribute to exfiltration include:

- groundwater depth (in relation to sewer line/depth of flow of sewage)
- type of soil
- faults

Climate conditions that influence exfiltration include:

- average frost line in relation to sewer depth
- average rainfall, which helps determine groundwater depth

In a typical exfiltrating sanitary sewer system, with the groundwater level below the sewage flow surface, exfiltration can occur in several areas. Figure 2-1 schematically represents these exfiltration sources, including defective joints and cracks in the service laterals, local mains, and trunk/interceptor sewers. The level of ground water and the depth of flow in the sewer will influence the extent of exfiltration rates, since the pressure differential

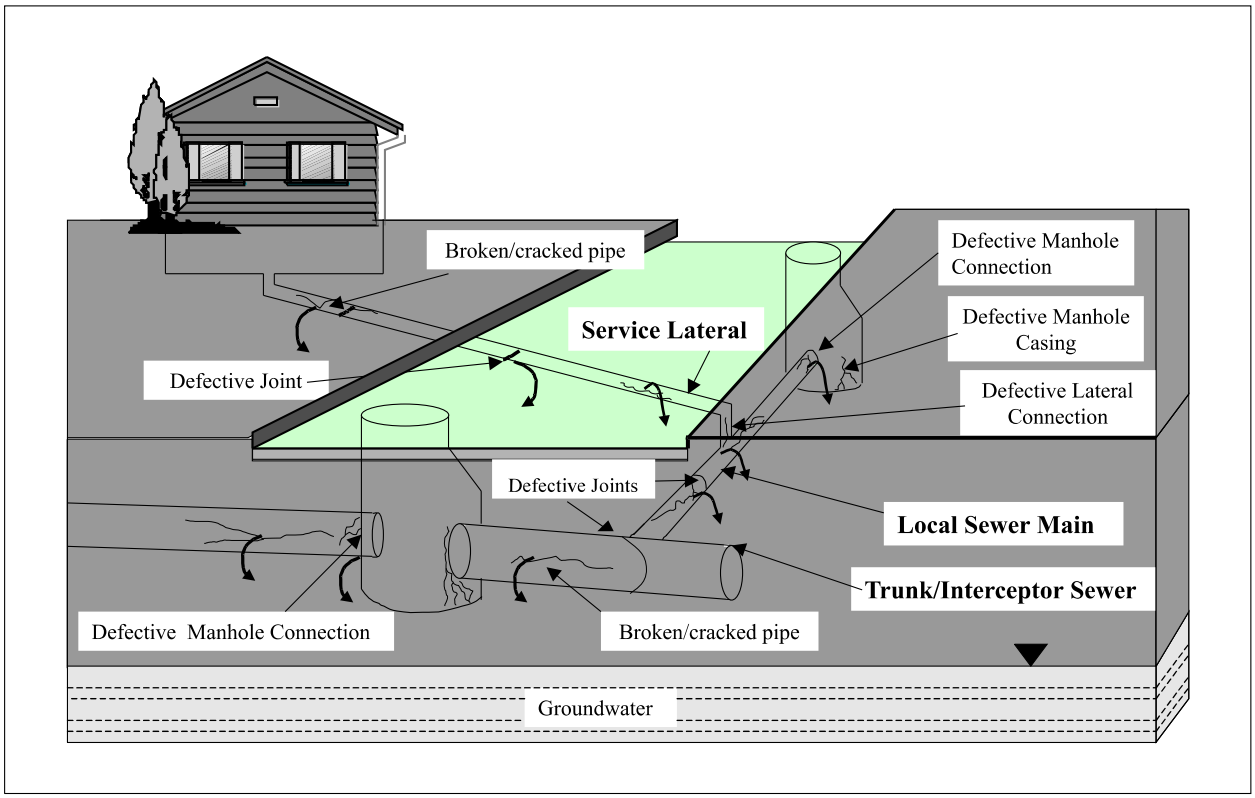


Figure 2-1. Sanitary sewer system components and exfiltration sources.

between the hydraulic head in the sewer and the groundwater hydraulic head will force water out of the sewer apertures into the surrounding soil material.

2.2 Health and Environmental Impacts

This section addresses the potential health impacts of exfiltration on ground water, drinking water distribution systems, and surface water.

2.2.1 Ground Water

Little published data is available on specific incidents of groundwater pollution and associated health/environmental impacts arising from leaking sewers, despite the widespread acknowledgment that these incidents occur. Several studies have indicated widespread pollution of ground water in urban areas arising from the general leakiness of sewers, including bacteria and ammonium reported from Wisconsin and general pollution in the San Joaquin Valley in California.[1]

Transport of the sewage and pollutants leaking into the subsurface/ground water depends on a variety of factors, including but not limited to: the difference in hydraulic head between the sewage surface and the groundwater table level, the substrate physical/chemical/ biological characteristics (which determines attenuation potential), and the sewage pollutants and their concentrations. Fecal bacteria contamination is the most serious health risk associated with domestic sewage exfiltration. Contamination by viruses, protozoa, and other microorganisms is also a concern. Increased concentrations of total organic carbon, nitrate, chloride, and sulfate, however, can also make the water unfit for consumption. Phosphate and boron are good indicators of sewage pollution since they are not naturally occurring in ground water.[2]

The solids present in sewage can plug the porous media beneath the pipe and rapidly decrease the exfiltration rate. In an experiment completed to examine this effect, the leakage was reduced to a steady state within an hour.[3]

As evidence of pollution from sewage, chloride and nitrate have been found to travel together. A California study indicated that ammonium disappeared within 4 feet, probably by adsorption and bacteriological activity. Bicarbonate and nitrate increased several hundred percent and nitrite disappeared.[4]

2.2.2 Water Supply Distribution Systems

Because of minimum separation requirements for potable water supply distribution systems and sanitary sewers and vigilant application of cross-connection control programs, the opportunity for sewer exfiltration to contaminate drinking water supplies is theoretically rather limited. Only one such potential documented case was found in a comprehensive data/information search.[5] Sewage from exfiltration can enter a distribution system through a broken water main or, under reduced pressure conditions, through a hole which leaks drinking water out under normal positive pressure conditions. Situations which could allow infiltration of the sewage through a lowering of water main pressure primarily involve backflow and surges.

Main Breaks

Despite the best efforts of utilities to repair water main breaks using good sanitary procedures, these breaks represent an opportunity for contamination from exfiltration to enter the distribution system. When a main breaks, utilities typically isolate the affected section, superchlorinate, and flush the repaired pipe. Flushing velocities may not always remove all contaminated debris, however, and microbiological testing of the final water quality may not detect contaminating microorganisms. In 1989, Cabool, Missouri[5] experienced a suspected cross-connection between sewage overflow and two major distribution system line breaks (backflow may have occurred during simultaneous repair of numerous water meters) caused by freezing temperatures, resulting in 243 cases of diarrhea, 32 hospitalizations, and four deaths due to *E. coli* O157:H7 strain. This town of

2000 was on an untreated groundwater system and did not superchlorinate during repairs of the water main breaks.

Backflow

Backflow devices to prevent the entry of contaminated water constitute an important distribution system barrier. Because of cost considerations, backflow-prevention devices are primarily installed on commercial service lines at facilities that use potentially hazardous substances. Such facilities include hospitals, mortuaries, dry cleaners, and industrial users. It is uncommon for all service connections to have backflow prevention devices; thus, back siphonage can occur at these unprotected points. Furthermore, installation of backflow devices at all service connections would make routine checking of the devices nearly impossible. Without routine inspection, proper functioning of the units cannot be determined.

Surges

Recent research is focusing on transient pressure waves that can result in hydraulic surges in the distribution system. These waves, having both a positive and negative amplitude, can draw transient negative pressures that last for only seconds and may not be observed by conventional pressure monitoring. Because these waves travel through the distribution system, at any point where water is leaking out of the system, the transient negative pressure wave can momentarily draw water and sewage (if present) back into the pipe.[6]

2.2.3 Surface Water Pollution

No data or narrative information in the literature demonstrate, or even suggest, that sewer exfiltration has directly contaminated surface waters. Several factors that control the occurrence of sewer exfiltration may explain the absence of a linkage between exfiltration and surface water pollution.

The occurrence of exfiltration is limited to those areas where sewer elevations lie above the groundwater table. Since groundwater elevations near surface water bodies are typically near the ground surface, sewers near surface water bodies generally are below the groundwater table, and infiltration (rather than exfiltration) will dominate the mode of sewer leakage in these areas. In areas of steep topographic conditions, where sewers are located near surface waters and at elevations that lie above the surface water, exfiltration impacts may be possible. However, these situations are assumed to be sufficiently rare that exfiltration impacts on surface waters are not observed.

Chapter 3
Methodology for Determining the Magnitude of Exfiltration on a National Scale

The process of estimating the magnitude of the exfiltration problem on a national scale has been performed as a series of two independent steps:

- Qualitatively assessing the portion of the nation's sewer systems that are susceptible to exfiltration;
- Applying assumptions about exfiltration rates (percent of base sewer flow) to the exfiltration susceptible sewer systems to provide an assessment of the extent of sewer exfiltration on a national scale.

3.1 Identification of Exfiltration Susceptible Sewer Systems

The key factor influencing the occurrence of exfiltration is the direction of the hydraulic gradient between the sewer flow surface and the groundwater table (GWT) external to the sewer. Where (and/or when) the direction is toward the sewer, exfiltration will be <0 (i.e., the hydraulic gradient will cause infiltration, rather than exfiltration). This situation is probably best analyzed by evaluating the depth of the sewers (and service laterals) relative to the groundwater table. In much of the northeastern, southeastern, and midwestern United States, relatively high groundwater tables typically result in infiltration conditions. Exceptions include shallow sewers, service laterals, and seasonal variation in GWTs that can significantly change the spatial extent of the sewer system that lies above the GWT (i.e., that can be considered to be "exfiltration susceptible"). To a lesser degree, short-term reversals in the gradient that may occur during wet weather (e.g., surcharged sewers which temporarily experience high sewage flow surface above the GWT, and may therefore briefly exfiltrate) may also need to be considered.

Given the importance of first screening out those areas that are not "exfiltration susceptible," the initial desktop analysis task was to perform spatial analysis of sewer depth relative to regional GWT elevations. Existing national-scale groundwater information was examined, such as that provided by the U.S. Geological Survey (e.g., USGS Groundwater Regions of the United States). As the various national groundwater data sources were reviewed, however, it was determined that mapping in support of the purposes of this study was not readily available. For this reason, a national depth-to-groundwater map was prepared under this project from groundwater level data available

in the national databases (U.S. EPA STORET and USGS WATSTORE) and presented in Section 5 of this report.

It is recognized that there may be seasonal variability in the portion of sewer systems susceptible to exfiltration in some areas, as GWTs can vary seasonally. The extent to which seasonal differences must be accounted for was assessed in reviewing the correlations to sewer depth.

National-scale sewer depth data does not exist, but for purposes of the desktop analysis some assumptions about this parameter can be made. For example, typical service lateral depth can be assumed to be 8 feet for buildings with basements, and 2 to 4 feet for houses built on slabs. Typical sewer main depth can be assumed to be 6 to 10 feet; it may be possible for more detailed assessments to develop a typical depth distribution (i.e., x % 4-10 ft deep, y% 11-15 ft deep, z% > 15 ft deep). Regional differences should be considered; for example, sewer depths typically are shallower in the western United States than in other areas of the country. Sewer system density (miles/acre) can be correlated with readily available national population density data to create a GIS coverage of sewer system density.

GIS processing incorporating the general spatial (mapped) relationships between sewer depth and groundwater elevations allowed the development of a characterization of the "exfiltration susceptibility" of various areas. This was attempted at the national level, but the data required to support this analysis are unavailable; thus, a representative area (Albuquerque, New Mexico) for which a recent exfiltration study had been completed, was selected on which to perform the analysis. National exfiltration rate assessments can be extrapolated from this analysis. However, more detailed identification and inventory of exfiltration susceptible areas is required to support a meaningful quantification of national exfiltration rates.

3.2 Estimating National Exfiltration Rates

Estimation of the extent of exfiltration that actually occurs was addressed with the same set of parameters that are applied to characterize and quantify the infiltration problem: sewer condition, joint type, pipe material, age, etc. Similarly, correcting the problem can be assumed to involve the same technologies as are applied to infiltration (various lining approaches, etc.). For purposes of this project, however, it was necessary to make simplifying assumptions about exfiltration rates and corrective actions. More detailed investigations in the future can examine the spatial variability in exfiltration rates that can be correlated to the sewer condition, joint type, pipe material, and sewer age parameters. Corrective action costs can also be refined later with more detailed assessments of required actions.

For purposes of this study, unit rates for exfiltration (gallons/day/inch/mile) available from the 1989 EPA study[7] were used to generate the assessment of the magnitude of the

national exfiltration problem. These unit rates were applied to the "exfiltration susceptible" areas (together with assumptions about the inch-miles of sewers/service laterals in those areas) to generate exfiltration rates in the Albuquerque case study. The unit rates based on gallons/day/inch/mile were compared with estimates based on percent of base sewer flow. Comparisons of the two methods proved useful in developing the final estimates.

Chapter 4
Corrective Measures

The proper selection of corrective or rehabilitation methods and materials depends on a complete understanding of the problems to be corrected, as well as the potential impacts associated with the selection of each rehabilitation method. Pipe rehabilitation methods to reduce exfiltration (and simultaneously infiltration) fall into one of the two following categories:

- External Rehabilitation Methods
- Internal Rehabilitation Methods

Certain conditions of the host pipeline influence the selection of the rehabilitation method. It is therefore necessary to assess these factors to prepare the pipe for rehabilitation. Rehabilitation is proceeded by surface preparation by cleaning the pipe to remove scale, tuberculation, corrosion, and other foreign matters.

4.1 External Sewer Rehabilitation Methods

External rehabilitation methods are performed from the aboveground surface by excavating adjacent to the pipe, or the external region of the pipe is treated from inside the pipe through the wall. Some of the methods used include:

- External Point Repairs

- Chemical Grouting
  - Acrylamide Base Gel
  - Acrylic Base Gel

- Cement Grouting
  - Cement
  - Microfine Cement
  - Compaction

4.2 Internal Sewer Rehabilitation Methods[8, 9, 10]

The basic internal sewer rehabilitation methods include:

- Chemical Grouting - Internal grouting is the most commonly used method for sealing leaking joints in structurally sound sewer pipes. Chemical grouts do not stop leaks by filling cracks; they are forced through cracks and joints, and gel with surrounding soil, forming a waterproof collar around leaking pipes. This method is accomplished by sealing off an area with a "packer," air testing the segment, and pressure injecting a chemical grout for all segments which fail the air test. The three major types of chemical grout are:

  – Acrylic
  – Acrylate
  – Urethane

- Sliplining - In this method, pipes are inserted into an existing line by pulling or pushing pipes into a sewer. The space between the existing pipe and liner pipe is grouted. Sliplining can be segmental or continuous. Small pipes including service laterals are usually continuous, with the larger sizes being segmental. Major types of sliplining are:

  Continuous Pipe - insertion of a continuous pipe through the existing pipe

  – Polyethylene
  – Polypropylene

  Segmental - Short segments of new pipe are assembled to form a continuous line, and forced into the host pipe. Generally, this method is used on larger sized pipe and forced into the host pipe.

  – Polyethylene
  – Polyvinyl Chloride
  – Reinforced Plastic Mortar
  – Fiberglass Reinforced Plastic
  – Ductile Iron
  – Steel

- Cured-in-Place Pipe (CIPP) - The CIPP process involves the insertion of a flexible lining impregnated with a thermosetting resin into a cleaned host pipe using an inversion process (hot water or steam). The lining is inserted using existing manholes.

  Because the liner initially is flexible, the pressurized steam or water also serves to form it in the shape of the existing pipe. The resin hardens with the application of

heat and with the passage of time (generally a few hours) to form a pipe within the existing pipe.

- Closed-fit Pipe - This involves pulling a continuous lining pipe that has been deformed temporarily so that its profile is smaller than the inner diameter of the host pipe. After installation, the new pipe expands to its original size and shape to provide a close fit with the existing pipe. Most lining pipe is deformed in the manufacturing plant.

- Fold and Form Pipe - This is similar to sliplining, except that the liner pipe is deformed in some manner to aid insertion into the existing pipe. Depending on the specific manufacturer, the liner pipe may be made of PVC or HDPE. One method of deforming the liner is to fold it into a "U" shape before insertion into the existing pipe. The pipe is then returned to its original circular shape using heated air or water, or using a rounded shaping device or mandrel. Ideally, there will be no void between the existing pipe and the liner pipe after expansion of the liner pipe with the shaping device. For the "U" shape liner, the resulting pipe liner is seamless and jointless.

- Spiral Wound Pipe - This involves winding strips of PVC in a helical pattern to form a continuous liner on the inside of the existing pipe. The liner is then strengthened and supported with grout that is injected into the annular void between the existing pipe and the liner. A modified spiral method is also available that winds the liner pipe into a smaller diameter than the existing pipe, and then by slippage of the seams, the liner expands outward.

- Pipe Bursting - Pipe Bursting is a method of replacing existing sewers by fragmenting the existing pipe and replacing the pipe in the void.

    1. Hydraulic Method - In this method a solid rod is inserted into the existing pipe and a bursting head is attached to the rod, which is then attached to a new replacement pipe. Hydraulic power is used to retract the rod and bursting head, and draw in new pipes. Existing sewer pipe is broken into fragments, which are driven into the surrounding soil.

    2. Pneumatic Method - This system consists of a pneumatic burster unit that splits the existing pipe while simultaneously installing a new polyethylene pipe of the same size or larger. Over 90 percent of the bursting is done by this method.

    3. Static Head - Static heads have no moving parts. The head is simply pulled through the old pipe by a heavy-duty pulling device.

- Spot (Point) Repair - Point repairs are used to correct isolated problems in a pipe. Sometimes they are used as the initial step in the use of other rehabilitation

methods. Point repairs include:

1. Robotic Repair
2. Grouting/Sealing
3. Special Sleeves
4. Point CIPP

4.3 Issues Related to the Limitations of Existing Technologies

The City of Houston, Texas recently completed model simulations and determined that comprehensive rehabilitation was not cost-effective.[11] It was found cheaper to relieve Houston's collection system bottlenecks for the short duration. This study noted that many types of rehabilitation and varying levels of rehabilitation, however, were not tested and could prove to be cost-effective. Soil characteristics and climatology vary from region to region, as do sewer system conditions and available system capacity, and the conclusions found in Houston may not be applicable to other parts of the country.

Thousands of communities have rehabilitated portions of their collection systems; yet very few know whether or not they have been successful. The problem is that no one can forecast how effective the rehabilitation will be. A recent literature search found that only 91 sewer sheds worldwide have post rehabilitation infiltration/inflow (I/I) reduction information available.[12] Average reported reduction is 49 percent of peak I/I rate. No data was found on the amount of exfiltration reduction from rehabilitation.

Pipe bursting may be limited in use where the pipe has sags. This technology's use is limited to cast or ductile iron pipe or concrete encasement. Pipe bursting may not be applicable where other existing utilities are close to the pipe.

Some sliplining applications require a round host pipe. Clearance should be checked before this method is employed.

Chapter 5
Results

This section describes the results of using various methods to estimate exfiltration from sewers. These methods have been developed and used in several locations in the United States and Europe. Some of these methods have been applied to calculate potential exfiltration in Albuquerque's sewer system, for which one of the most extensive exfiltration studies in the United States to-date has been completed.[12] For this reason, Albuquerque has been selected as a case study, from which the national extent of sewer exfiltration can be assessed.

The results of the 1998 exfiltration study from Albuquerque are extrapolated qualitatively by evaluating the exfiltration susceptibility of sewer systems throughout the United States. Susceptibility is defined by the relative depths of the sewers and groundwater table. In cases where sewer depths are generally shallower than the surrounding ground water, the potential to exfiltrate exists (because the direction of the hydraulic gradient is toward the exterior of the sewer) and these sewers can therefore be considered exfiltration susceptible. A national depth-to-groundwater map has been prepared for use in this assessment of the national extent of exfiltration susceptible sewer systems.

The findings of the Albuquerque case study were combined with the national depth-to-groundwater mapping to present a qualitative assessment of the extent to which sewer exfiltration represents a risk to water quality and human health on a national scale. Much of the information presented in Section 5.1 is taken from the 1998 Albuquerque study.[12]

5.1 National Scale Quantification

Although exfiltration is not a widely studied phenomenon, several exfiltration studies and investigations have been completed throughout the world. These include work completed in the United States for the U.S. EPA and several studies in Europe, the majority of which are focused on Germany. Some of the more applicable previous studies are discussed below.

Three basic approaches have been used to quantify sewer exfiltration rates: 1) direct measurement of flow in isolated sewer segments, 2) theoretical estimates using Darcy's Law and related hydraulic theory, and 3) water balance between drinking water

produced/delivered and wastewater collected/treated. Each of these approaches has been applied to the Albuquerque case study and is described below.

5.1.1 Estimates Based on Direct Measurements (U.S. EPA Study)

An EPA study entitled "Evaluation of Groundwater Impacts of Sewer Exfiltration" was completed in the late 1980's.[7] The work estimated exfiltration in two California city sewer systems to develop a correlation between exfiltration and infiltration. The tests were conducted in areas of vitrified clay pipe (VCP) predominance, where older pipe of known or suspected poor condition existed. Only those pipe segments located above groundwater levels were tested. Water consumption was metered for all sewer service connections corresponding with each measured sewer line to determine the actual quantity of wastewater flow entering the system. It was assumed that all internal household water entered the sewer system. Measurements of sewage flow in the sewer lines were made by continuous flow monitoring and hydrostatic testing. Calculated sewer exfiltration was reported in units of gallons per inch diameter per mile length per day (gpimd). Table 5-1 presents a summary of the exfiltration rates.

Table 5-1. Summary of Exfiltration Rates from Continuous Flow Monitoring and Hydrostatic Testing (Engineering Science, Inc., 1989)

Location	Pipe Information	Exfiltration Rate Cont. Flow Monitoring (gpimd)[a]	Exfiltration Rate Hydrostatic Testing (gpimd)
Berkeley, CA Pardee Street	320 linear feet (lf) of 8-in. - diameter VCP	5,649 (34% of flow)	6,327
Berkeley, CA 7th Street	298 lf of 6-in. - diameter VCP	5,283 (56% of flow)	5,649
Santa Cruz, CA Beach Street	260 lf of 8-in. - diameter VCP	6,557	2,417
Santa Cruz, CA Riverside Parking Lot	124 lf of 6-in. - diameter VCP	77,745	8,324

[a] gallons per inch diameter per mile length per day

This table shows that a large discrepancy exists between the results from the continuous flow monitoring and the hydrostatic testing at one Santa Cruz location. The study concludes that the continuous flow monitoring achieved reliable data and that the hydrostatic test data was influenced by the tidal cycle. A correlation model between exfiltration and infiltration was developed, but not field tested.

A second evaluation was performed using field measurements at another location to verify the correlation model. This evaluation used similar methodologies as the first task.

Exfiltration measurements were made in the Washington Suburban Sanitary Commission (WSSC) sewer system near Washington, D.C., and in Lexington, Kentucky. Table 5-2 presents a summary of the measurement results from the evaluation.

Table 5-2. Summary of Exfiltration Measurements (Engineering Science, Inc., 1989)

Location	Pipe Information	Average Exfiltration Rate (gpimd)[a]	Exfiltration as Percentage flow (%)
WSSC John Hanson Highway	1,400 lf of 8-in. - diameter VCP	16,248	16.6
WSSC University of MD	832 lf of 10-in. - diameter VCP	63,312	49.1
Lexington, KY Lumber Yard	455 lf of 8-in. - diameter VCP	17,103	22.6
Lexington, KY Car Lot	1,029 lf of 8-in. - diameter VCP	9,061	31.3
Lexington, KY Various Shops	586 lf of 10-in. - diameter VCP	5,664	11.9
Lexington, KY Various Shops	586 lf of 10-in. - diameter VCP	15,689	34.5

[a] gallons per inch diameter per mile length per day; lf = linear feet

Several problems with the measurement methodologies were noted, and overall the hydrostatic test method was judged to be not successful. It was resolved that the flow monitoring procedure worked well and should be applied to areas with a minimum of 400-500 linear feet of pipe with little or no service connections.

5.1.2 Estimates Based on Darcy's Law and Related Theory (European Studies)

The study of exfiltration has been of great interest in Germany. This country has a very old, deteriorated infrastructure. The cost to complete the necessary repairs to Germany's sewer systems is estimated to be nearly $100 billion (U.S.). Therefore, several exfiltration studies have been conducted to prioritize repair work. These studies have both applied theoretical (Darcy's Law) approaches and direct measurements to estimate sewer exfiltration. Excerpts from some of the studies are summarized below.

- A report from England[13] provided an estimate of 300 x 10^6 m^3/yr (793 x 10^8 gal/yr) or approximately 1 liter/day/m (397 gal/day/mile) for the exfiltration of the 880,000 km (547,000 miles) of sewer lines in Germany, although the basis of the estimate is not clear. This very low sewer leakage rate is actually net exfiltration, which is the difference between exfiltration and infiltration. The study indicates that total exfiltration and infiltration in Germany are nearly equal, but the amounts are not provided.

- To better understand the mechanics of exfiltration, sewage migration from leaking pipes to ground water was correlated in a study using Darcy's Law (see Equation 1).[3] The rate of exfiltration is linearly dependent on the area of the pipe exfiltrating and the pressure head:

  (1) $Q = L\ A\ dh$

  where Q is the exfiltration rate (ft^3/s) through a pipe leak area A (ft^2) at a pressure head of dh (ft), and L is leakage factor (s^{-1}).

  The leakage factor is defined in Equation 2:

  (2) $L = K/dL$

  where K is the permeability of the surrounding soil (ft/s) and dL is the thickness of the settleable soil layer (ft).

  This study found that the settleable solids in the wastewater act to reduce the permeability of the bedding material and lower the exfiltration rate rapidly at low flows and velocities. This clogging reduces the rate of exfiltration immediately. In fact, a steady-state rate of exfiltration was reached after one hour, even with large area of joint damage.

- A research project undertaken by the Institute of Environmental Engineering (ISA) at the University of Technology of Aachen, Germany, studied the water pollution hazard of leaking sewers.[14, 15, 16] The ISA developed and used a special exfiltration measuring device at every joint in several sections of sewer pipe on several tests conducted throughout Germany. This study determined that the most significant VCP sewer damages which permit exfiltration are leaking service junctions, leaking sewer joints, pipe cracks, and pipe fractures. At a pressure head below the sewer crown, which is typically the case in gravity flow sewer lines, exfiltration rates were minimal. At a pressure head of one pipe diameter, the exfiltration rate increased dramatically, to more than 26 gal/hour (gph) per joint in some segments. This high leakage rate can, in part, be attributed to the generally poor condition of the old sewer systems. A linear correlation between pressure head and exfiltration rate for several types of sewer defects was noted for pressure heads greater than 500 mm (20 inches). It was also noted that at lower flows and pressure heads, the exfiltration rate decreases exponentially, most likely from self-sealing from sewer film and settleable solids in the sewage. If the flow and pressure head increases, however, this self-sealing property is broken and the exfiltration rate increases rapidly.

5.1.3 Estimates Based on Drinking Water - Wastewater Balance

In this section, exfiltration from Albuquerque's sewer system is estimated using a water/sewage balance calculation, backed up by some previous local studies on infiltration. The results are then compared with leakage rates calculated from the other methodologies and unit rates derived from the EPA and European studies presented above.

A direct method for estimating exfiltration is to compare water pumpage and usage with wastewater received at Albuquerque's Southside Water Reclamation Plant (SWRP). To make this comparison, it is necessary to identify the base water demand, which is the indoor component of the total household use. Demands during mid-winter (January and February) are assumed to be near base flow because no or very minimal outdoor water usage occurs. Water and wastewater data obtained from the City for January 1998 revealed the following:

- Average daily influent flow at the SWRP: 51.4 mgd

- Average daily water pumpage into transmission/distribution system: 61.2 mgd (this is then considered to be the daily base flow for that month)

Subtracting wastewater flow from the pumpage rate yields a difference of 9.8 mgd, which is the first approximation of sewage leakage. However, several other factors also impact the water balance in the water and wastewater systems. These are:

- Sewer infiltration
- In-house water consumption
- Water distribution system leakage
- Sewer exfiltration

City of Albuquerque staff, using a range of available information (including meter and billing records, pumpage records, and other data), have estimated losses in the water system at about 11 percent of the total amount pumped. A 1997 study[17] found water system losses ranging from 8 percent in Hong Kong, which is considered to have a relatively "tight" and high-quality system, to the 20-25 percent range in England, which has many very old distribution systems. An 11 percent loss in the system would account for a daily average loss of about 6.73 mgd.

In-house consumption is the portion of the water entering the house that does not leave as sewage, but is consumed in cooking, drinking, watering plants, cleaning, etc. National experience indicates that about 3 percent of water entering the home is consumed on an average day in January 1998. With negligible non-domestic consumption, the remaining amount of water, about 1.4 mgd, represents the net difference between the two other factors in the water balance: sewer infiltration and exfiltration. The net amount is positive, indicating that exfiltration exceeds infiltration by 1.4 mgd, which is plausible given that the

great majority of Albuquerque's sewers, and particularly those most susceptible to exfiltration (older VCP), are in exfiltration areas (well above groundwater levels).

In order to estimate the exfiltration volume, previous studies addressing infiltration in the Albuquerque sewer system were reviewed. One of the studies[18] utilized several approaches to gain an approximation of inflow and infiltration in the Albuquerque system, most of which was attributed to infiltration in the valley of the Rio Grande. Some of these methodologies are described below:

- A flow comparison between winter water use and sewage flow. This methodology resulted in an infiltration flow of 3.7 mgd. However, the report stated that "this estimation is probably within ± 50 (percent) of the actual value…"

- Early morning sewage flow versus water use. This methodology resulted in an infiltration flow of nearly zero.

- Sewage flow versus population. Using a 100-gallons-per-capita-per-day wastewater flow and a population of 300,000, infiltration was estimated at 5 mgd. It was also noted that the average sewage flow for Albuquerque at this time was actually 117 gpcd.

- Influent BOD versus domestic wastewater BOD. The expected BOD concentration in the wastewater was calculated based upon a generally accepted BOD loading of 0.17 lb/cap/day. This BOD concentration was compared with the average influent concentration to calculate an infiltration flow of 5.9 mgd. However, this was thought to be a high estimate based upon the relatively small industrial component and the high institutional contribution.

In addition, the study field-verified the areas subject to infiltration. Based upon the above calculations and results of the field tests, infiltration was thought to be somewhat less than 3 mgd, or 9 percent of the wastewater flow in 1975. Nine percent of today's wastewater flow would be in the 5 mgd range.

Another infiltration analysis was completed as part of the Albuquerque ASAM Model Loading and Verification Task.[19] Interceptor manholes that were within 2 feet of ground water were identified. Flow monitoring was completed in a sewer subbasin, and the resulting flows were compared with the predicted flows to determine infiltration. The infiltration rate for Albuquerque was calculated at 0.925 mgd, but, again, the impact of exfiltration was not included. Therefore, the work revealed a net infiltration rate, indicating that actual infiltration is about 1 mgd greater than total exfiltration.

From the foregoing investigations, it is estimated that the total average infiltration rate for the Albuquerque system is in the vicinity of 3.5 mgd. The 9 percent field-verified rate

reported in the Molzen-Corbin report is probably high, given the repair and replacement of major interceptors in the valley that have occurred since 1975, as well as the use of better quality materials and construction techniques for new pipelines since then. On the other hand, repairs have generally not been made to the sewers most susceptible to exfiltration -- old vitrified clay pipes (VCP).

The total exfiltration rate is obtained by adding the 1.4 mgd remaining in the water balance to the infiltration rate, for a total of 4.9 mgd, or approximately 5 mgd.

5.1.4 Comparison of the Various Methodologies – Albuquerque Case Study

Unit Rates from U.S. EPA Study

The 1989 U.S. EPA exfiltration study is discussed in Section 5.1.1 above, and some of the results are summarized in Tables 5-1 and 5-2. Application of measured exfiltration rates from this study (in gpimd) to the 66.5 miles of Albuquerque VCP sewers (average diameter of 8.57 inches) that are potentially in condition C (major cracks) or D (severe cracks) results in total exfiltration rates ranging from 1.38 mgd to 44.1 mgd (504 Mg/yr to 16,907 Mg/yr). These calculated quantities are listed in Table 5-3. Although there is a very wide range in calculated rates, many of them are in the 3 to 4 mgd range calculated above using a water balance.

Table 5-3. Calculated Exfiltration Rates Using United States EPA Study Results

Location	Measured Unit Rates (gpimd)	Equivalent Albuquerque Quantities[a] (mgd)
Berkeley, CA, Pardee Street	5,649; 6,327	3.2; 3.6
Berkeley, CA, 7th Street	5,283; 5,649	3.0; 3.2
Santa Cruz, CA, Beach Street	6,557; 2,417	3.7; 1.4
Santa Cruz, CA, Riverside Parking Lot	77,745; 8,324	44.3; 4.7
WSSC, John Hanson Highway	16,248	9.3
WSSC, University of MD	63,312	36.1
Lexington, KY, Lumber Yard	17,103	9.8
Lexington, KY, Car Lot	9,061	5.2
Lexington, KY, Various Shops	5,664; 15,689	3.2; 8.9

[a] For 66.5 miles of suspected Class C and D pipe, average diameter 8.57 inches.

European Methods

Section 5.1 discusses the results of several exfiltration studies carried out in Germany. Applying these methods and unit rates to the Albuquerque sewer system yields several estimates as follows:

- The study by Lerner and Halliday[13] presented an estimated net exfiltration rate of 397 gal/day/mile for the whole of Germany. Applying this figure to the entire length of clay and concrete sewers in Albuquerque's system yields a total net exfiltration rate (net leakage) of about 0.46 mgd. This is reasonably close to the net exfiltration rate of 1.4 mgd calculated by the water balance in Section 5.1.3. It is expected that, on average, a greater percentage of Germany's sewers are in infiltration areas than is the case in Albuquerque. On the other hand, Germany's sewers are also older and undoubtedly in overall worse condition, therefore more susceptible to exfiltration. Thus, a near balance in exfiltration and infiltration is possible. Albuquerque has a greater percentage of sewers above groundwater level, but a smaller portion that is likely to heavily exfiltrate.

- The study completed by Rauch and Stegner[3] determined that exfiltration could be correlated by Darcy's Law. A leakage factor dependent upon the bedding grain size and permeability affects the exfiltration rate (refer to Equations 1 and 2 in Section 5.1.2). For this study, the leakage factor was back-calculated using Darcy's Equation with the data presented in Rauch's report. This calculated leakage factor was then used in Darcy's Equation to calculate the exfiltration rate for 8-inch-diameter pipes flowing half full, with every joint separated one-quarter inch to approximate conditions for Albuquerque. The exfiltration rate was calculated as 7.9 mgd (2,900 Mg/yr). However, not every joint will have a quarter-inch separation. The ISA German studies discussed above[14, 15, 16] summarized the sewer damage noted in the project. About 30 percent of the VCP sewers have leaking sewer joints. The infrastructure in Albuquerque is not as old as that of Germany and therefore is in better condition. If we assume every fourth joint (25 percent) will be separated one-quarter inch, the exfiltration quantity is 2 mgd or 725 Mg/yr.

- The German ISA project determined that at a 4-inch head (equivalent to an 8-inch pipe flowing half full), the exfiltration rate was nearly zero. However, a storm sewer was found to have an exfiltration rate, dependent upon the type of damage, ranging from 4 to 10.5 gallons per hour per joint. This rate yields an exfiltration quantity of 8.2 to 21.9 mgd (3,000 to 8000 Mg/yr) for the Albuquerque sewer system. It is probable, however, that not every joint is leaking even in pipe of condition C or D. Assuming every fourth joint is leaking (25 percent as discussed above) presents an estimate of 2 to 5.5 mgd (769 to 2,000 Mg/yr).

Table 5-4 presents a summary of the estimates of sewer exfiltration for the Albuquerque area based on data from the European studies.

Table 5-4. Estimates of Sewer Exfiltration Quantities for the Albuquerque Sewer System Based on Published European Exfiltration Rates

Source/Study Location	Daily Quantity	Annual Quantity
Munich, Germany measurement of 24,600 gpmd	1.65 mgd	600 Mg/yr
Darcy's Equation, every joint offset 0.25 inch	7.9 mgd	2,900 Mg/yr
Darcy's Equation, every 4th joint offset 0.25 inch	2 mgd	730 Mg/yr
ISA Study – every joint leaking 4 g/hr	8.2 mgd	3,000 Mg/yr
ISA Study – every joint leaking 10.5 g/hr	22 mgd	8,000 Mg/yr
ISA Study – every 4th joint leaking 4 g/hr	2 mgd	730 Mg/yr
ISA Study – every 4th joint leaking 10.5 g/hr	5.5 mgd	2,000 Mg/yr

Based on a review of the above exfiltration rates for Albuquerque as calculated with the various EPA and European unit figures and methodologies, it can be seen that the rate of 5 mgd determined in Section 5.1.3 is very much within the range that would be expected. Although the calculated rates vary widely, the majority are within the 2 to 10 mgd range. Therefore, the rate of 5 mgd, as determined by the water balance described in Section 5.1.3, is presented as the best estimate of the average daily wastewater exfiltration rate from Albuquerque's sewer system.

It is further concluded that the majority of this leakage will occur in those areas most susceptible to exfiltration, as approximately 15 percent of the sewer system in Albuquerque is estimated to be below the groundwater table and therefore not exfiltration susceptible.

5.2 National Depth to Groundwater Mapping

In order to extrapolate the Albuquerque findings to a national scale, a qualitative assessment of exfiltration susceptibility has been made using depth-to-groundwater information. Since no such mapping at a national scale suitable for this purpose was readily available, an initial mapping effort was undertaken as part of this study.

The development of a nationwide depth-to-groundwater atlas is difficult at best due to the lack of easily obtainable data for most of the country. Data to determine the depth to the shallowest water table may be gathered from local, state, federal, and private sources through well logs, water level measurements, location of wetlands and seeps, characterization of streams and rivers, and locations of lakes and other water bodies. A thorough characterization of the U.S. water table is a long and exacting process.

Within the context of this study, the depth-to-groundwater map presented in Figure 5-1 is a generalized view created using readily available data from the EPA STORET and USGS WATSTORE databases of depth-to-groundwater parameters. The data were downloaded

from CDROM databases resident at the CDM Hydrodata Center in Denver, Colorado. The data were screened to eliminate missing depth-to-water values, missing latitude and longitude, duplicate data, and easily recognized anomalous data. The resultant set contained approximately 93,000 data points in the coterminous United States, Alaska, and Hawaii (only the coterminous U.S. is shown below). Since the data retrieved from STORET and WATSTORE is dependent upon the data owner for accuracy, there is no comprehensive method of quality control. USGS data are continually reviewed, however, and these data may be deemed reasonably accurate. The STORET and WATSTORE databases, while certainly robust, do not contain all data available; therefore, data gaps exist which are labeled (in the data tables) as insufficient data.

Despite the large dataset applied to build the map, many regions of the United States have relatively limited data; these areas are unshaded on the map. Areas with the greatest concentration of valid data points within the deep groudwater range are generally west of the Mississippi River and along the Appalachian Mountains.

The data set was plotted upon a map of the United States using ESRI Arcview 3.1 GIS application with a Spatial Analyst extension. A grid was produced with a cell size of 10000 for the coterminous U.S. and Alaska and 1000 for Hawaii. An inverse distance weighted interpolation method (IDW) was used based on the 12 closest points. The IDW interpolator assumes that each point has a local influence that diminishes with distance.

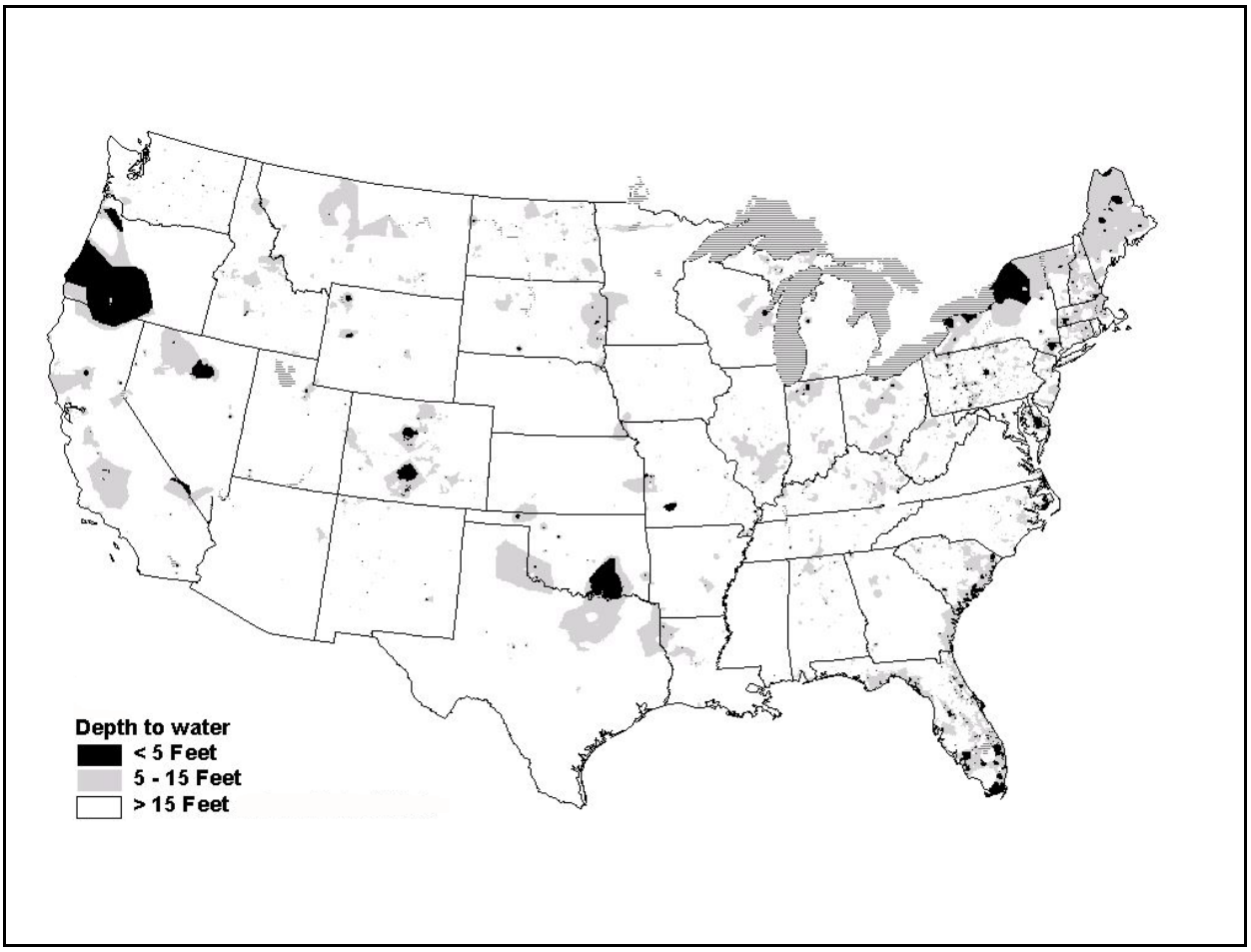


Figure 5-1. National depth-to-groundwater map.

Note: It is important to read Section 5.2 for a detailed explanation of background data basis.

5.3 Conclusions

Most of the urban areas in the northeastern, southeastern, and coastal areas of the U.S. have relatively shallow groundwater tables (<15 feet). In these areas, where a significant portion of the population (and therefore sewer systems) exists, relatively few exfiltration-susceptible sewer systems are expected. One caveat is exfiltration from service laterals. Even in the areas mentioned, many shallow service laterals may exist above groundwater tables. However, the hydraulic head available to drive exfiltration in these service lines is generally very low (typically only one or two inches, and intermittent). Further study in this area may be warranted to assess the extent of service lateral exfiltration.

Based on a review of the depth-to-groundwater map, it is expected that widespread exfiltration is probably limited to a relatively small portion of the total U.S. population, as relatively few large urban areas in the U.S. are located in these deeper groundwater areas. Cities such as Albuquerque, Phoenix, Tucson, and others, are among the larger urban areas where significant exfiltration potential exists. Further study of exfiltration conditions in cities such as these, with relatively large areas with sewers above the groundwater table, may be warranted on a case-by-case basis where evidence of exfiltration (e.g., groundwater contamination) has been observed, or is revealed by more detailed evaluations. Areas with extremely deep groundwater tables probably experience relatively less risk associated with exfiltration due to the long subsurface travel times and distances of the exfiltrated sewage from the sewer to the groundwater table. Areas with significant portions of the system above, but in close proximity to, the groundwater table are probably at greatest risk. There is an increased risk in the relatively few areas with significant exfiltration potential when there is, for example, a thin soil and fractured rock hydrogeologic setting which allows pathogens and other contaminants from the sewage to reach the ground water quickly and with minimal attenuation. However, since public water supplies are treated with chlorination, ozonation, or other systems to kill fecal bacterial contamination, an added measure of protection is provided.

A greater potential problem, albeit isolated, may be exfiltration from sewers carrying industrial wastewater. Organic and inorganic constituents of industrial sewage can be much more persistent than those of domestic sewage, and therefore much more likely to reach the ground water in areas of significant exfiltration potential. The disposition of industrial sewage contaminants which reach ground water used for drinking water supplies may not be the same as that of fecal bacteria from domestic sewage [i.e., the treatment processes (flocculation, filtration, chlorination, activated carbon filtration, etc.) may not eliminate or reduce these contaminants to render them harmless]. Untreated well water in some rural, small community, commercial, and private-owner drinking water systems does not enjoy this added protection. However, these systems are not typically in close proximity to large municipalities and associated sewer systems/exfiltration potential.

The Albuquerque Case Study concluded that the rate of exfiltration from that sewer system, expressed as a percentage of base flow, is on the order of 10% of average daily base wastewater flow - in absolute terms, roughly 5 mgd. This rate, expressed as an average annual rate, is 1,825 Mg/yr. Another relevant conclusion of the Albuquerque study was that there is a greater impact on ground water from septic tank usage than from sewer exfiltration. As the foregoing depth-to-groundwater analysis indicates, however, exfiltration is expected to vary significantly on a regional basis. Further study should expand the initial depth-to-groundwater analysis performed here and identify more precisely the “exfiltration susceptible” sewer systems throughout the U.S. and the extent to which exfiltration impacts ground water in these systems.

In summary, exfiltration appears to be a problem in certain cities in the United States (mainly located west of the Mississippi River and along the Appalachian Mountains) based on an evaluation of: 1) available groundwater table data to nationally assess the extent to

which sewer systems are susceptible to exfiltration, 2) past studies of measured and estimated exfiltration rates, and 3) protective mechanisms, particularly natural soil/hydrogeological setting attenuation and drinking water treatment plants. Exfiltration may be a regional, or more likely, local problem where the GWT lies closely under the sewage flow surface. Situations where the exfiltrate can reach even deep ground water through a thin soil/fractured rock hydrogeologic setting, especially where persistent, potentially toxic contaminants are present (such as those often associated with industrial sewage) also pose a problem.

5.4 Corrective Measure Costs

Given the relatively high rates of exfiltration that potentially discharge from exfiltration-susceptible sewer systems in the U.S., corrective measures may be required to adequately protect groundwater resources, and in some limited instances surface waters, in these areas. The site-specific nature of exfiltration problems, however, requires a more detailed assessment of the larger urban areas in the exfiltration-susceptible western U.S. be completed before a meaningful estimate of corrective costs can be developed.

Corrective actions to address exfiltration in those situations where local-level evaluation calls for such action will generally be accomplished with similar technologies as those used to address infiltration. These technologies are described in Section 4. Although an estimate of national-scale costs to address exfiltration must follow more detailed evaluation of exfiltration-susceptible sewer systems, it is possible to identify corrective action costs on a unit basis (i.e., cost ($) per linear foot of sewer) in this study. The following table provides an example of those costs assuming the use of cured-in-place lining as the method of sewer rehabilitation.[20]

Table 5-5. Example Sewer Rehabilitation Costs for Exfiltration Corrective Action

Sewer Diameter (inches)	Cost ($) per linear foot
8	60
10	71
12	77
15	130
18	160
21	225
24	295
27	310
30	535
36	590

Chapter 6
Recommendations

This study identified the following data/technology gaps associated with exfiltration. Recommendations for research and development to fill these gaps were developed for each data/technology gap identified.

1. Data Gap - comprehensive national depth-to-groundwater maps: Although a large portion of the U.S. has readily available, accurate depth-to-groundwater data, many regions of the United States have relatively limited data.

   Recommendation:

   An effort to refine the initial depth-to-groundwater mapping produced in this study with an expanded and updated database would support a more detailed national estimate of exfiltration and the cost of associated corrective measures.

2. Data Gap - extent of exfiltration in municipalities: There are relatively few large urban areas in the U.S. which have the potential for widespread exfiltration. Western arid U.S. cities such as Albuquerque, Phoenix, and Tucson are among the larger metropolitan areas where significant exfiltration potential exists and little is known about it. Albuquerque's exfiltration has recently been studied extensively.

   Recommendation

   Further study of localized exfiltration conditions in cities with high exfiltration potential may be warranted on a case-by-case basis where evidence of exfiltration has been observed, or is revealed by more detailed groundwater study. This study should be preceded by assessment using the refined depth-to-groundwater mapping recommended above to produce a national inventory of exfiltration susceptible areas. This localized study will be of greater value than an attempt to quantify the problem nationally, due to the localized nature of the problem.

3. Data Gap - exfiltrate fate and transport: No information is available regarding the biological disposition of sewage exfiltrate. Also, it would be useful to determine if a biological crust forms in the bedding below an exfiltrating sewer that would serve to insulate/protect groundwater and/or water supply distribution systems.

Recommendation:

Research to fill the exfiltration disposition data gap could involve the use of existing sewage systems known or determined to be leaking in significant amounts (using carefully excavated examination of the bedding beneath and adjacent to the leaking sewer joints), or by construction of an experimental leaking sewer system (artificially introducing sewage into the sewer systems bedding). An analysis of bedding samples from points at increasing depths and horizontal distances from the leak would help to reveal the extent of exfiltrate transport.

4. Combined/Separate Sewer Considerations for Detailed Urban Study

Recommendation

The sewer systems to be considered in future exfiltration assessments should include both combined and separate sewer areas, since combined sewers are often located in highly urbanized areas where imperviousness is high. The result is a decreased rainfall infiltration into the soil and lowering of the GWTs, making these sewers potentially more susceptible to exfiltration. Additionally, combined sewers are often shallower than separate sewers, older than separate sewers, and constructed with less-watertight pipe joints - all factors that can contribute to higher exfiltration rates. Another special case that must be considered in more detailed studies is force mains. Although they are often constructed with tighter pipe joints and more durable pipe material, they nonetheless operate under pressure and may therefore be more exfiltration susceptible.

5. Inclusion of Service Laterals

Recommendation

It will be important to more detailed exfiltration assessments of urban areas to consider service laterals together with public sewers in identifying and evaluating the exfiltration susceptible sewers. Service laterals are the shallowest portion of the sewer system (largest hydraulic gradient difference with GWT) and typically of the poorest construction.

References

No.

1. Hoffman, M., and D. Lerner. "Leak Free Sewers." *Water and Waste Treatment*, Vol. 35, No. 8, 1992.

2. "The Impact of Sewers on Groundwater Quality." *Groundwater Problems in Urban Areas*, 1994.

3. Rauch, W., and T. Stegner. "The Culmination of Leaks in Sewer Systems During Dry Weather Flow." *Water Science and Technology,* pp. 205-210, Vol. 30, No. 1, 1994.

4. "Nitrogen Compounds in Natural Water - A Review." *Waste Resources Research.* Vol. 2, No. 1, 1966.

5. Geldreich, E.E. *Microbial Quality of Water Supply in Distribution Systems.* Lewis Publishers, Boca Raton, FL. 1996.

6. LeChevallier, M.S. "The Case for Maintaining a Disinfectant Residual." *Journal of the American Water Works Association.* Vol. 91, Issue 1.

7. U.S. Environmental Protection Agency. *Results of the Evaluation of Groundwater Impacts of Sewer Exfiltration* - Engineering-Science Pb95-158358. February 1989.

8. Bell, R.E., Jr., and G.G. Williams. "Sewer Rehabilitation: Developing Cost-Effective Alternatives." Construction Congress V, Engineered Construction in Expanding Global Markets: *Proceedings of the Congress,* 1997.

9. Sewer Maintenance for Rehabilitation. Chapter D-9 from *Public Works Manual*, 1996.

10. Gwaltney, T. "The Total System Solution™" In *Proceedings of the 1995 Construction Congress.*

11. Camp, Dresser & McKee, *Greater Houston Wastewater Program*, 1993.

12. Camp, Dresser & McKee Inc. *City of Albuquerque - Water Construction Program Evaluation - Sanitary Sewer Exfiltration Analysis*, September 1998.

13. Lerner, D.N., and D. Halliday. "The Impact of Sewers on Groundwater Quality," *Groundwater Problems in Urban Areas,* Thomas Telford, London, 1994.

14. Decker, J. “Environmental Hazard by Leaking Sewers,” In *Proceedings of Water Quality International, IAWQ 17th Biennial International Conference*, Budapest Hungary, July 24-29, 1994.

15. Decker, J. “Pollution Load of Subsoil, Groundwater, and Surface Water by Leaky Sewer,” In *Proceedings from Hydrotop 94*, Marseille France, April 12-16, 1994.

16. Decker, J. “Investigations about Quantitative and Qualitative Pollution Load of Subsoil, Ground - and Surface Water by Leaky Sewer,” In *Proceedings of the Sixth International Conference on Urban Storm Drainage*, Niagara Falls, Ontario, Canada, September 12-17, 1993.

17. Lerner, D. “The Use of Marker Species to Establish the Impact of the City of Nottingham, UK on the Quantity and Quality of Its Underlying Groundwater,” *Groundwater in the Urban Environmental: Problems, Processes and Management,* Balkema, Rotterdam 1997.

18. Moltzen-Corbin & Associates. *City of Albuquerque, New Mexico, Wastewater Facilities Plan, Infiltration/Inflow Analysis,* 1976.

19. CH2M Hill. *Wastewater System Modeling and Analysis - Model Loading and Verification, Task 205 and 206.* City of Albuquerque, January 1991.

20. Camp, Dresser & McKee. Internal project cost records. 1999.

Glossary Of Terms[1]

1. Combined Sewer

   A sewer intended to serve as a sanitary sewer and a storm sewer, or as an industrial sewer and a storm sewer.

2. Excessive Infiltration/Inflow

   The quantities of infiltration/inflow which can be economically eliminated from a sewer system by rehabilitation, as determined by cost-effectiveness analysis that compares the costs for correcting the infiltration/inflow conditions with the total costs for transportation and treatment for the infiltration/inflow.

3. Exfiltration

   Exfiltration is the leaking of wastewater from a sanitary or combined sewer into the surrounding soil, and potentially, into the groundwater. Exfiltration occurs when the sewer condition degrades to an extent where pipe defects (cracks, joint separation, etc.) allow wastewater to leak out of the sewer. Exfiltration can cause groundwater pollution if the rate and/or volume of wastewater leakage exceeds the ability of the subsurface soil to filter, absorb or immobilize certain pollutant constituents that may be present in the wastewater. Exfiltration is distinguished from infiltration (see below) by the direction of the hydraulic gradient across the sewer wall boundary. For exfiltration to occur, the hydraulic gradient must drive flow external to the sewer; with infiltration, groundwater depths above the flow line in the sewer drive flow into the sewer.

4. Infiltration

   The water entering a sewer system and service connections from the ground, through such means as, but not limited to, defective pipes, pipe joints, connections or manhole walls. Infiltration does not include, and is distinguished from, inflow.

5. Infiltration/Inflow

   The total quantity of water from both infiltration and inflow without distinguishing the source.

6. Infiltration/Inflow Analysis

---

[1] U.S. Environmental Protection Agency, Office of Water Program Operations, Handbook for Sewer System Evaluation and Rehabilitation, December 1975.

An engineering and, if appropriate, an economic analysis demonstrating possibly excessive or nonexcessive infiltration/inflow.

7. Inflow

The water discharged into a sewer system, including service connections, from such sources as, but not limited to, roof leaders, cellar, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections from storm sewers and combined sewers, catch basins, storm waters, surface run-off, street wash waters, or drainage. Inflow does not include, and is distinguished from, infiltration.

8. Internal Inspection

An activity of the Sewer System Evaluation Survey. This activity involves inspecting sewer lines that have previously been cleaned. Inspection may be accomplished by physical, photographic and/or television methods.

9. Physical Survey

An activity of the Sewer System Evaluation Survey. This activity involves determining specific flow characteristics, groundwater levels and physical conditions of the sewer system that had previously been determined to contain possibly excessive infiltration/inflow.

10. Preparatory Cleaning

An activity of the Sewer System Evaluation Survey. This activity involves adequate cleaning of sewer lines prior to inspection. These sewers were previously identified as potential sections of excessive infiltration/inflow.

11. Rainfall Simulation

An activity of the Sewer System Evaluation Survey. This activity involves determining the impact of rainfall and/or runoff on the sewer system. Rainfall simulation may include dyed water or water flooding the storm sewer sections, ponding areas, stream sections and ditches. In addition, other techniques such as smoke testing and water sprinkling may be utilized.

12. Rehabilitation

Repair work on sewer lines, manholes and other sewer system appurtenances that have been determined to contain excessive infiltration/inflow. The repair work may involve grouting of sewer pipe joints or defects, sewer pipe relining, sewer pipe replacement and various repairs or replacement of other sewer system appurtenances.

13. Sanitary Sewer

A sewer intended to carry only sanitary and industrial wastewaters from residences, commercial buildings, industrial plants and institutions.

14. Sewer System Evaluation Survey

A systematic examination of the tributary sewer systems or subsections of the tributary sewer systems that have demonstrated possibly excessive infiltration/inflow. The examination will determine the location, flow rate and cost of correction for each definable element of the total infiltration/inflow problem.

15. Storm Sewer

A sewer intended to carry only storm waters, surface run-off, street wash waters, and drainage.

SEC. 307. **Coastal Zone Management Act (U.S.)**

(a) In carrying out his functions and responsibilities under this title, the Secretary shall consult with, cooperate with, and, to the maximum extent practicable, coordinate his activities with other interested Federal agencies.
(b) The Secretary shall not approve the management program submitted by a state pursuant to section 306 unless the views of Federal agencies principally affected by such program have been adequately considered.
(c)

(1)
(A) Each Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs. A Federal agency activity shall be subject to this paragraph unless it is subject to paragraph (2) or (3).
(B) After any final judgment, decree, or order of any Federal court that is appealable under section 1291 or 1292 or title 28, United States Code, or under any other applicable provision of Federal law, that a specific Federal agency activity is not in compliance with subparagraph (A), and certification by the Secretary that mediation under subsection (h) is not likely to result in such compliance, the President may, upon written request from the Secretary, exempt from compliance those elements of the Federal agency activity that are found by the Federal court to be inconsistent with an approved State program, if the President determines that the activity is in the paramount interest of the United States. No such exemption shall be granted on the basis of a lack of appropriations unless the President has specifically requested such appropriations as part of the budgetary process, and the Congress has failed to make available the requested appropriations.
(C) Each Federal agency carrying out an activity subject to paragraph (1) shall provide a consistency determination to the relevant State agency designated under section 306(d)(6) at the earliest practicable time, but in no case later than 90 days before final approval of the Federal activity unless both the Federal agency and the State agency agree to a different schedule.

[307 (c)(1) revised by PL 101-508]
(2) Any Federal agency which shall undertake any development project in the coastal zone of a state shall insure that the project is, to the maximum extent practicable, consistent with the enforceable policies of approved state management programs.

[307 (c)(2) amended by PL 101-508]
(3)
(A) After final approval by the Secretary of a state's management program, any applicant for a required Federal license or permit to conduct an activity, in or outside of the coastal zone, affecting any land or water use or natural resource of the coastal zone of that state shall provide in the application to the licensing or permitting agency a certification that the proposed activity compiles with the enforceable policies of the state's approved program and that such activity will be conducted in a manner consistent with the program. At the same time, the applicant shall furnish to the state or its designated agency a copy of the certification, with all necessary information and data. Each coastal state shall establish procedures for public notice in the case of all such certifications and, to the extent it deems appropriate, procedures for public hearings in connection there with. At the earliest practicable time, the state or its designated agency shall notify the Federal agency concerned that the state concurs with or objects to the applicant's certification. If the state or its designated agency fails to furnish the required notification within six months after receipt of its copy of the applicant's certification, the state's concurrence with the certification shall be conclusively presumed. No license or permit shall be granted by the Federal agency until the state or its designated agency has concurred with the applicant's certification or until, by the state's failure to act, the concurrence is conclusively presumed, unless the Secretary, on his own initiative or upon appeal by the applicant, finds, after providing a reasonable

opportunity for detailed comments from the Federal agency involved and from the state, that the activity is consistent with the objectives of this title or is otherwise necessary in the interest of national security.

[307(c)(3)(A) amended by PL 101-508]

(B) After the management program of any coastal state has been approved by the Secretary under section 306, any person who submits to the Secretary of the Interior any plan for the exploration or development of, or production from, any area which has been leased under the Outer Continental Shelf Lands Act (43 U.S.C. 1331 et seq.) and regulations under such Act shall, with respect to any exploration, development, or production described in such plan and affecting any land use or water use or natural resource of the coastal zone of such state, attach to such plan a certification that each activity which is described in detail in such plan compiles with the enforceable policies of such state's approved management program and will be carried out in a manner consistent with such program. No Federal official or agency shall grant such person any license or permit for any activity described in detail in such plan until such state or its designated agency receives a copy of such certification and plan, together with any other necessary data and information, and until-

[307(c)(3)(B) introductory text amended by PL 101-508]

(i) such state or its designated agency, in accordance with the procedures required to be established by such state pursuant to subparagraph (A), concurs with such person's certification and notifies the Secretary and the Secretary of the Interior of such concurrence;
(ii) concurrence by such state with such certification is conclusively presumed as provided for in subparagraph (A), except if such state fails to concur with or object to such certification within three months after receipt of its copy of such certification and supporting information, such state shall provide the Secretary, the appropriate federal agency, and such person with a written statement describing the status of review and the basis for further delay in issuing a final decision, and if such statement is not so provided, concurrence by such state with such certification shall be conclusively presumed; or

[(ii) revised by PL 95-372, September 18, 1978]

(iii) the Secretary funds, pursuant to subparagraph
(A), that each activity which is described in detail in such plan is consistent with the objectives of this title or is otherwise necessary in the interest of national security. If a state concurs or is conclusively presumed to concur, or if the Secretary makes such a finding, the provisions of subparagraph (A) are not applicable with respect to such person, such state, and any Federal license or permit which is required to conduct any activity affecting land uses or water uses in the coastal zone of such state which is described in detail in the plan to which such concurrence or findings applies. If such state objects to such certification and if the Secretary fails to make a finding under clause (iii) with respect to such certification, or if such person fails substantially to comply with such plan as submitted, such person shall submit an amendment to such plan, or a new plan, to the Secretary of the Interior. With respect to any amendment or new plan submitted to the Secretary of the Interior pursuant to the preceding sentence, the applicable time period for purposes of concurrence by conclusive presumption under subparagraph (A) is 3 months.

(d) State and local governments submitting applications for Federal assistance under other Federal programs, in or outside of the coastal zone, affecting any land or water use of natural resource of the coastal zone shall indicate the views of the appropriate state or local agency as to the relationship of such activities to the approved management program for the coastal zone. Such applications shall be submitted and coordinated in accordance with the provisions of title IV of the Intergovernmental Coordination Act of 1968 (82 Stat. 1098). Federal agencies shall not approve proposed projects that are inconsistent with the enforceable policies of a coastal state's management program, except upon a finding by the Secretary that such project in consistent with the purposes of this title or necessary in the interest of national security. [307(d) amended by PL 101-508] (e) Nothing in this title shall be construed-

(1) to diminish either Federal or state jurisdiction, responsibility, or rights in the field of planning, development, or rights in the field of planning, development, or control of water resources, submerged lands, or navigable waters; nor to displace, supersede, limit, or modify any interstate compact or the jurisdiction or responsibility of any legally established joint or common agency of two or more states or of two or more states and the Federal Government; nor to limit the authority of Congress to authorize and fund projects;

(2) as superseding, modifying, or repealing existing laws applicable to the various Federal agencies; nor to affect the jurisdiction, powers, or prerogatives of the International Joint Commission, United States and Canada, the Permanent Engineering Board, and the United States operating entity or entities established pursuant to the Columbia River Basin Treaty, signed at Washington, January 17, 1961, or the International Boundary and Water Commission, United States and Mexico.

(f) Notwithstanding any other provision of this title, nothing in this title shall in any way effect any requirement

(1) established by the Federal Water Pollution Control Act, as amended, or the Clean Air Act, as amended, or

(2) established by the Federal Government or by any state or local government pursuant to such Acts. Such requirements shall be incorporated in any program developed pursuant to this title and shall be the water pollution control and air pollution control requirements applicable to such program.

(g) When any state's coastal zone management program, submitted for approval or proposed for modification pursuant to section 306 of this title, includes requirements as to shorelands which also would be subject to any Federally supported national land use program which may be hereafter enacted, the Secretary, prior to approving such program, shall obtain the concurrence of the Secretary of the Interior, or such other Federal official as may be designed to administer the national land use program with respect to that portion of the coastal zone management program affecting such inland areas.

(h) In case of serious disagreement between any Federal agency and a coastal state-

(1) in the development or the initial implementation of a management program under section 305; or (2) in the administration of a management program approved under section 306; the Secretary, with the cooperation of the Executive Office of the President, shall seek to meditate the differences involved in such disagreement. The process of such meditation shall, with respect to any disagreement described in paragraph

(2), include public hearings which shall be conducted in the local area concerned.

(i) With respect to appeals under subsections (c)(3) and (d) which are submitted after the date of the enactment of the Coastal Zone Act Reauthorization Amendments of 1990, the Secretary shall collect an application fee of not less than $200 for minor appeals and not less than $500 for major appeals, unless the Secretary, upon consideration of an applicant's request for a fee waiver, determines that the applicant is unable to pay the fee. The Secretary shall collect such other fees as are necessary to recover the full cost of administering and processing such appeals under subsection (c).

[307 (i) added by PL 101-508]