JUNE 6, 2008

SUBJECT: DRAFT CONSTRUCTION GENERAL PERMIT

Public Comment
Draft Construction Permit
Deadline: 6/11/08 by 12 p.m.

MR. WOLFF;

THANK YOU FOR THE OPPORTUNITY TO COMMENT ON THE DRAFT CONSTRUCTION GENERAL PERMIT.

#1) WITH REGARDS TO THE COMPLEXITY AND SIMPLICITY ISSUES, I BELIEVE THAT THE GENERAL PERMIT MUST BE SPECIFIC TO STATE AND LOCAL PUBLIC ENTITIES SO AS TO LIMIT THE ABILITY OF STAFF PERSONAL TO ADMINISTRATIVELY ISSUE VARIANCES WITHOUT PUBLIC REVIEW. THE OVERBURDENING OF PUBLIC RIGHT OF WAYS AND EASEMENTS FROM DRAINAGE OF SURFACE WATER CONTRIBUTES TO THE POLLUTION OF SURFACE WATER AS WELL AS GROUND WATER.

#2) I STRONGLY BELIEVE THAT AN INDEPENDENT THIRD PARTY IS THE WAY TO GO. THIS INDIVIDUAL SHOULD HAVE FIELD EXPERIENCE AS WELL AS THE ABILITY TO LOOK AT A PROJECT HOLISTICALLY SO THAT THE INTENT OF THE PERMIT AND LOCAL ORDINANCES ARE ADHEARED TO. THE STATE WATER BOARD SHOULD HAVE AN OMBUDSMAN THAT REPORTS TO STATE BOARD STAFF AS WELL AS THE BOARD OF DIRECTORS AS A WHOLE.

JUNE 6, 2008

SUBJECT: DRAFT CONSTRUCTION GENERAL PERMIT

#2) CONT. THIS WILL GIVE THE BOARD OF DIRECTORS THE ABILITY TO NOT ONLY REVIEW PLANS AS PRESENTED BUT ALSO HAVE FOLLOW THROUGH TO VERIFY THAT THE AS-BUILT DRAWINGS CONFORM TO THE INTENT OF THE GENERAL PERMIT. THIS PRACTICE HAS BEEN SUCCESSFULLY USED IN PROJECTS THAT DEAL WITH NATIONAL SECURITY.

#3) NUMERIC VALUES MEAN NOTHING IF STRONG ENFORCEMENT CAN NOT BE IMPLEMENTED BY THE STATE WATER BOARD. EGREGIOUS VIOLATIONS, BE IT BY COMMISSION BY A CONTRACTOR OR BY OMISSION BY A REGULATORY AGENCIES STAFF, SHOULD BE TREATED AS CRIMINAL. THE GENERAL PERMI SHOULD SPECIFY CLEARLY THAT THE STATE WATER BOARD WILL HOLD PARTIES INVOLVED ACCOUNTABLE FOR INFORMATION TO BE CORRECT IN THE PROCESS AND THE IMPLEMENTATION WILL HAVE OVER-SITE.

MR. WOLFF, I BELIEVE THAT IT IS TIME TO TREAT THE IMPORTANCE OF TAKING CARE OF OUR WATER SUPPLY AND PROTECTION OF OUR OCEANS WITH THE SAME VIGOR THAT WE, AS AMERICANS, TREAT OUR NATIONAL SECURITY.

RESPECTFULLY;

RICHARD E.T. SADOWSKI
- B.S.M.E MECHANICAL TEST OPS ENGR
- CWEA GRADE IV WASTEWATER COLLECTIONS OPERATOR
- MEMBER OF DIRECTORY OF EXPERTS TO THE CALIF. O.P.C. SCIENTIFIC ADVISORY TASK TEAM.

JUNE 6, 2008

MR. WOLFF;

I HAVE ENCLOSED A COPY OF AN APPEAL THAT WAS SEINT TO MR. MIKE WATSON AT THE CALIFORNIA COASTAL COMMISION. IT IS MY OPINION THAT THIS MATTER DESERVES UPMOST ATTENTION AND INTERVENTION.

RESPECTFULLY

RICHARD E.T. SADOWSKI

805-795-1125

805-772-2610

email waterposse@YAHOO.COM.

CC. MR. DREW BOHAN
EXECUTIVE DIRECTOR
CALIFORNIA OCEAN PROTECTION COUNCIL

STATE OF CALIFORNIA – THE RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, *Governor*

CALIFORNIA COASTAL COMMISSION

CENTRAL COAST DISTRICT OFFICE
725 FRONT STREET, SUITE 300
SANTA CRUZ, CA 95060-4508
VOICE (831) 427-4863 FAX (831) 427-4877

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT

Please Review Attached Appeal Information Sheet Prior To Completing This Form.

SECTION I. Appellant(s)

Name: RICHARD E.T. SADOWSKI AND MARLA JO BRUTON

Mailing Address: 490 JAVA STREET

City: MORRO BAY Zip Code: 93442 Phone: 805-772-2610
805-795-1125(CELL)

SECTION II. Decision Being Appealed

1. Name of local/port government: CITY OF MORRO BAY, CALIFORNIA

2. Brief description of development being appealed:
1840 MAIN STREET, MORRO BAY CALIFORNIA
REF. CPO-124, CPO-108.1
LEGAL: LOTS: Pt of 15 & 16; BLOCK: 8; TRACT: RANCHO MORRO Y CAYUCOS

3. Development's location (street address, assessor's parcel no., cross street, etc.):
1840 MAIN STREET, MORRO BAY CALIFORNIA
APN 068-324-019

4. Description of decision being appealed (check one.):

☒ Approval; no special conditions

PS ☒ Approval with special conditions:

☐ Denial

Note: For jurisdictions with a total LCP, denial decisions by a local government cannot be appealed unless the development is a major energy or public works project. Denial decisions by port governments are not appealable.

TO BE COMPLETED BY COMMISSION:

APPEAL NO: _____

DATE FILED: _____

DISTRICT: _____

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT (Page 2)

5. Decision being appealed was made by (check one):

- ☐ Planning Director/Zoning Administrator
- ☐ City Council/Board of Supervisors
- ☒ Planning Commission
- ☐ Other

6. Date of local government's decision: MAY 19, 2008

7. Local government's file number (if any): —

SECTION III. Identification of Other Interested Persons

Give the names and addresses of the following parties. (Use additional paper as necessary.)

a. Name and mailing address of permit applicant:

- EQUILON ENTERPRISES (CPO-124)
- JOHN DEFRENZA (CPO-108)

20301 SW BIRCH ST, SUITE 101E, NEWPORT BEACH CA. 92660

b. Names and mailing addresses as available of those who testified (either verbally or in writing) at the city/county/port hearing(s). Include other parties which you know to be interested and should receive notice of this appeal.

(1) NOTE:
No PUBLIC COMMENT RECIEVED.
@ 5-19-08 MORRO BAY PLANNING
COMMISION.

(2)

(3)

(4)

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT (Page 3)

SECTION IV. Reasons Supporting This Appeal

PLEASE NOTE:

- Appeals of local government coastal permit decisions are limited by a variety of factors and requirements of the Coastal Act. Please review the appeal information sheet for assistance in completing this section.
- State briefly **your reasons for this appeal.** Include a summary description of Local Coastal Program, Land Use Plan, or Port Master Plan policies and requirements in which you believe the project is inconsistent and the reasons the decision warrants a new hearing. (Use additional paper as necessary.)
- This need not be a complete or exhaustive statement of your reasons of appeal; however, there must be sufficient discussion for staff to determine that the appeal is allowed by law. The appellant, subsequent to filing the appeal, may submit additional information to the staff and/or Commission to support the appeal request.

1) INSUFFIENT NOTICE TO CONCERNED CITIZENS AND STAKEHOLDERS WITH REGARDS TO DRINKING WATER QUALITY SUPPLY.

2) MISREPRESENTATION BY MORRO BAY SENIOR PLANNER THAT THIS PROJECT IS OUTSIDE THE CCC APPEALS JURISDICTION.

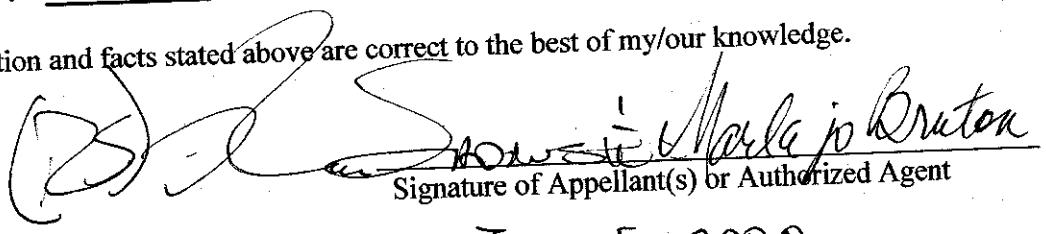
3) REF. "APPEAL of COASTAL PERMIT for 1840 MAIN STREET, MORRO BAY, CALIFORNIA (ATTACHMENT)

4) REF. THE "MORRO BASIN NITRATE STUDY" ISSUES AND CONCERNS

APPEAL FROM COASTAL PERMIT DECISION OF LOCAL GOVERNMENT (Page 4)

SECTION V. Certification

The information and facts stated above are correct to the best of my/our knowledge.



Signature of Appellant(s) or Authorized Agent

Date: JUNE 5, 2008

Note: If signed by agent, appellant(s) must also sign below.

Section VI. Agent Authorization

I/We hereby
authorize _____
to act as my/our representative and to bind me/us in all matters concerning this appeal.

_____
Signature of Appellant(s)

Date: _____

Appeal of Coastal Permit for 1840 Main Street, Morro Bay, California June, 2008

On May 19, 2008, the Morro Bay Planning Commission approved a project for 1840 Main Street (Case No. CP0-124). The City Planner in charge stated that the project was outside the CCC appeals jurisdiction. However, much of the project work involves the closure of MTBE monitoring wells that do lie in the CCC's jurisdiction. They are located west of Main Street, in close proximity to the ocean.

We are appealing those monitoring well closures on the grounds that they may be contributing to serious nitrate pollution of nearby Morro Bay drinking water wells, that they are needed to help verify the source of the nitrates. The monitoring wells lie directly above the aquifer that supplies the Morro Basin drinking water wells.

The 68 monitoring wells to be closed were drilled as part of the mitigation effort for MTBE contamination from a Shell service station formerly located at the 1840 Main Street site. The work also included significant excavations on that site. Mitigation began in 2000, and was completed in 2002. A recently issued study done by Cleath and Associates, the "Morro Basin Nitrate Study" includes data that we believe was never before shown to members of the public.

Data shows that in November, 2002, major spikes in the nitrate levels in Morro Basin drinking water wells began. These wells are, located in close proximity to the areas where mitigation work took place. These spikes continue to occur each November, far exceeding safe drinking water levels.

The City began using State water in 1998. The Morro Basin drinking water wells are used only in November, when State Water is shut down for maintenance.

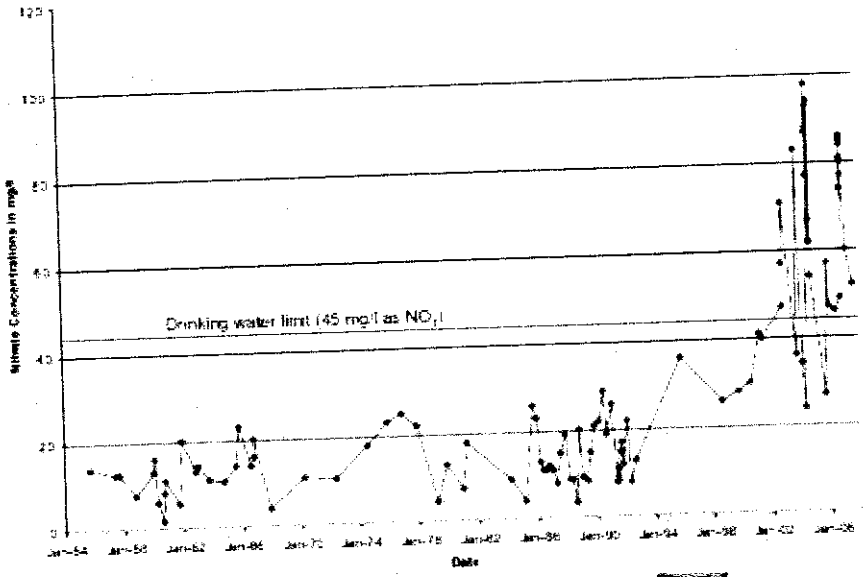


Figure 4
Well MB-3
Nitrate Concentrations
Morro Basin Nitrate Study
City of Morro Bay

Cleath & Associates

The Cleath study claimed the nitrates in the drinking water wells come from farming operations. However, we believe that no credible evidence was presented to support that theory. We believe that the nitrates come from sewage, exfiltrated from Morro Bay's dilapidated wastewater collection system. A separate report detailing our analysis and findings that support this belief is available on request.

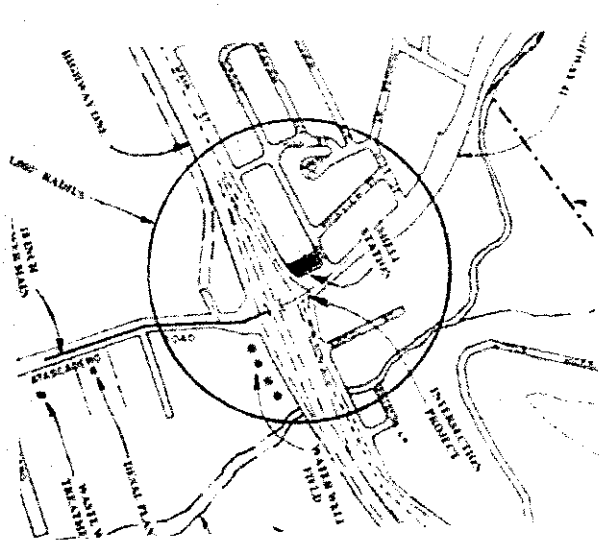
We have viewed video inspections of miles of Morro Bay's collection system lines, and have issued separate reports on their condition. A brief discussion of findings is provided in this document (Attachment A). The complete set of reports is also available, on request.

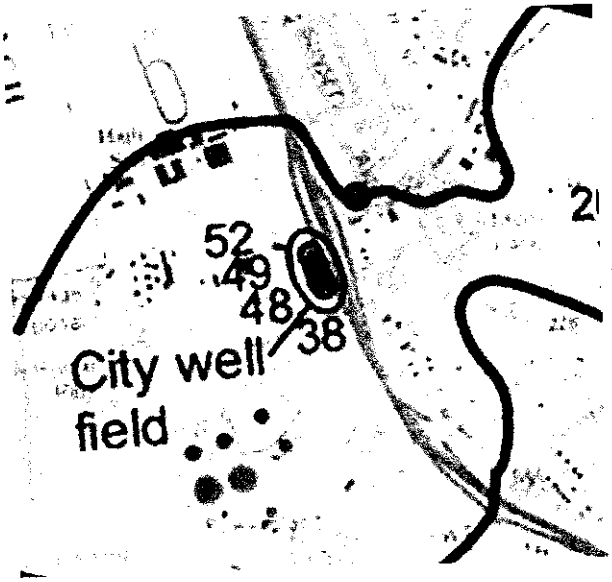
We believe that the nitrate level spikes that began in 2002 are a direct result of some of the MTBE mitigation work. We believe that the excavations at the 1840 Main site, and possibly the drilling of some of the MTBE monitoring wells, breached

the boundaries of the Morro Basin aquifer that supplies the wells, allowing groundwater contaminated with sewage to be pulled into the wells during the times they are pumping.

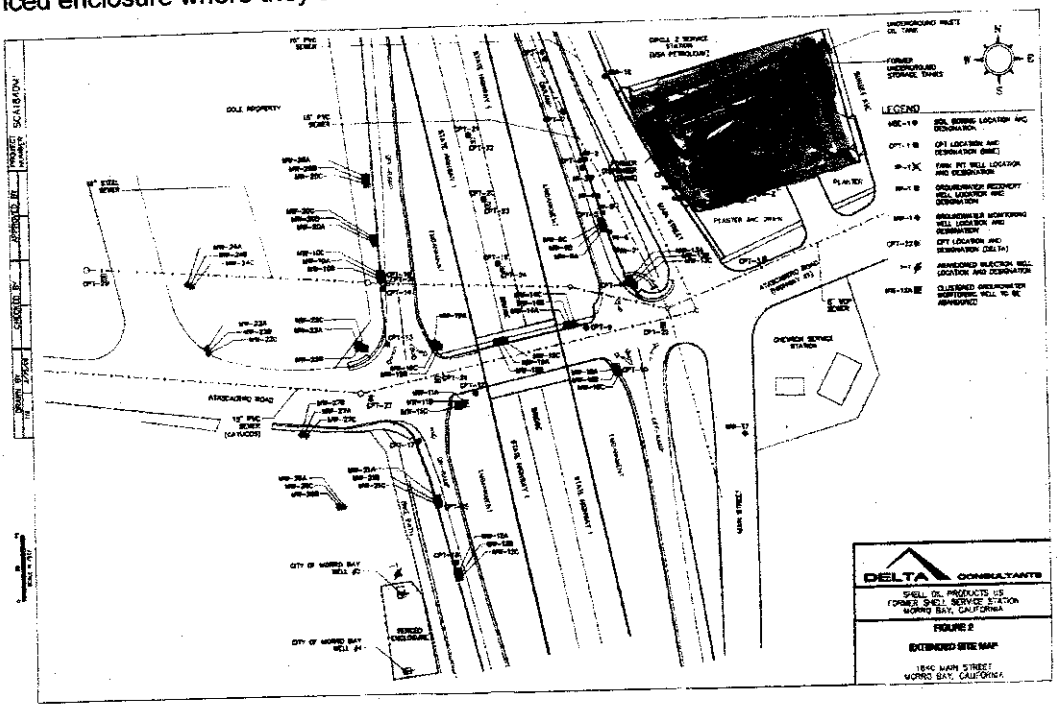
The map on the left, below, is from a City report, "The City of Morro Bay and MTBE". The 1840 Main Street site is marked by the rectangle shaded in red. The Morro Basin drinking water well field is marked by the blue dots. The map on the right is from the Cleath study. On this map, the 1840 Main Street site is marked by the blue dot. The black lines indicate the boundaries of the Morro Basin aquifer.

We believe it is clear that the 1840 Main site, where the extensive excavations, as well as some of the MTBE monitoring well drilling took place, lies directly on the aquifer boundary.





The following diagram shows the positions of the 68 MTBE monitoring wells, visible as clusters of black dots.. A larger version of this diagram is included in this appeal document (Attachment B). In this diagram, the 1840 Main Street site is shaded in red. Only the northernmost two Morro Basin drinking water wells in the well field are included on the map. The fenced enclosure where they are located is shaded in blue.



Appeal of Coastal Permit for 1840 Main Street, Morro Bay, California June, 2008

It is well known that unless monitoring wells are properly cased and sealed as they are drilled, they can serve as conduits for aquifer cross-contamination. We have no evidence that the MTBE mitigation consultants took such measures.

We are concerned that closure of the 68 monitoring wells at this time is premature, and should not be permitted, for the following reasons:

1. The issue of the true source polluting the Morro Basin drinking water wells is disputed. As previously noted, we believe the nitrates come from sewage. This viewpoint is supported by such evidence as the fact that isotope studies done by Cleath and Associates produced data that we believe clearly rules out fertilizer as a source, while providing significant evidence that sewage is a likely cause (see Attachment C).
2. The wells may be serving as conduits for contaminated ground water to enter the aquifer. This needs to be determined through appropriate testing (see item 3, below). If the wells are contributing to aquifer contamination, well closing must done properly, or they may continue to do so.
3. Prior to their closure, the monitoring wells will provide a valuable means to extract samples that will prove the true source of the nitrates. The wells, while drilled for the purpose of monitoring the MTBE plume, will be equally effective in tracking a plume of sewage-contaminated ground water pulled toward the wells when they are pumping.
4. The negative declaration for the 1840 Main project, completed in 2005 (SCH2005071022) was based on false information (See Attachment D). No waterways were listed, yet Little Morro Creek lies in close proximity to the site. In addition, only one school was listed as being in close proximity to the site. Morro Bay High School is closer to the site than Del Mar Elementary. In fact, some of the MTBE monitoring wells are located adjacent to the school's driveway.
5. The CEQA document prepared for the project, case number UPC-071/CPO-108 includes the following information:
   - Page 13: "7. Hazards/Hazardous materials", item b, 'Would the project" "Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.?". "NO" has been checked. We submit that there is a strong possibility that the 2000 – 2002 MTBE remediation work breached of the aquifer boundaries, meaning that this item should be checked, "YES". (See Attachment E)
   - Page 13: "7. Hazards/Hazardous materials", item c, 'Would the project" "Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school?". Many of the MTBE monitoring wells are located within one-quarter mile of Morro Bay High School. (See Attachment E)
   - Page 14: "8. Hydrogeology/Water Quality". Item a, "Would the project" "Violate any water quality standards or waste discharge requirements?" "NO" has been checked. We submit that if the monitoring wells have not been properly cased and sealed, and are serving as conduits for sewage-contaminated ground water to pass into the aquifer, then this item should be checked, "YES". (See Attachment F)

NOTE:
IN 1999 MTBE CONTAMINATION WAS ORIGINALLY DISCOVERED AT THE MORRO BAY/CAYUCOS WASTEWATER TREATMENT PLANT. FURTHER INVESTIGATION REVEALED THAT THE 1840 MAIN ST. SHELL/EQUILON SITE WAS THE SOURCE OF THE MTBE CONTAMINATION. THE MTBE CONTAMINATION WAS CONVEYED TO THE WASTEWATER TREATMENT PLANT VIA I&I FROM THE MAIN SEWER LINE LOCATED WITHIN THE MORRO BASIN AQUIFER. PART OF THE CORRECTIVE ACTION WAS THE MAIN SEWER LINE BE REPAIRED BY SLIP-LINING.

Attachment C

The value ranges noted on the left side of this chart are from a paper entitled, "Nitrate Forensics", by by William E. Motzer, Ph.D. Values given for tested samples from our wells, and for the tested fertilizer sample come from the Morro Basin Nitrate Study.

Table A

Expected Values for Various Sources		**Actual Values found in Morro Bay Wells**				**Actual Value for the Fertilizer Sample Tested**
$\delta_{15}N$ (‰) value ranges defined in "Nitrate Forensics"		**$\delta_{15}N$ (‰) in well MB-3**	**$\delta_{15}N$ (‰) in well MB-4**	**$\delta_{15}N$ (‰) in well MB-14**	**$\delta_{15}N$ (‰) in well MB-15**	**$\delta_{15}N$ (‰) in fertilizer sample tested**
Commercial fertilizer	−4 to +4	10.0	8.8	7.1	7.9	0.7
Animal or human waste	> +10					
Precipitation	−3					
Organic nitrogen in soil	+4 to +9					

The values from our wells are also a very close match to isotopic values for sewage, as documented in a paper titled "Ground-water Quality Impacts from On-site Septic Sytems ", by Dennis McQuillan

McQuillan Study Values

sewage from septic systems: **7.6 to 12.1**

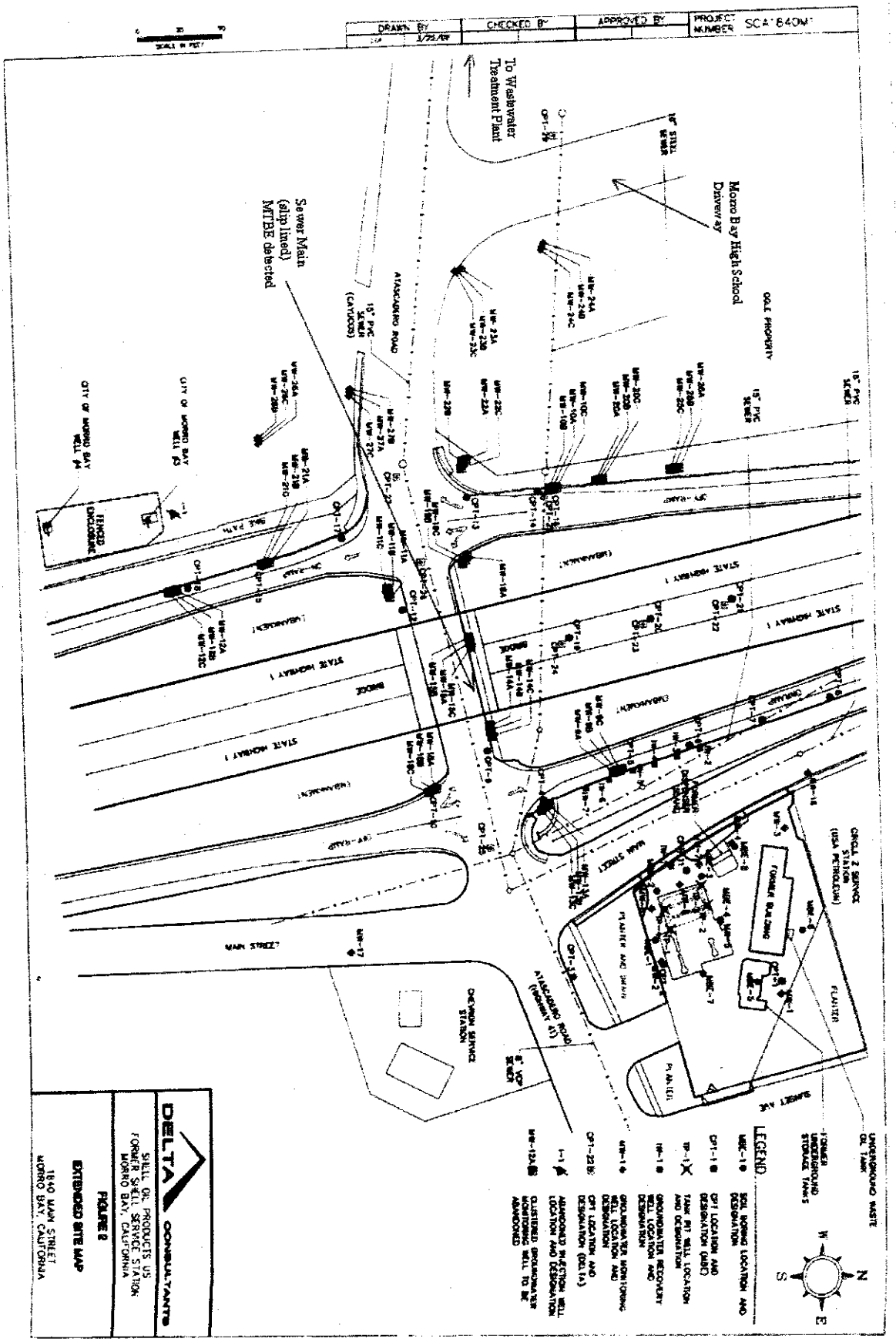
sewage at a primary sewage plant: **7.2 to 12.1**

Morro Basin Well Values: **7.1 to 10.0**

Standard Values for Commercial Fertilizer: **- 4 to + 4**

In addition, no evidence was provided, or is known that there has been any sudden increase in fertilizer use by Morro Valley farmers, in 2002, or at any other time.

Attachment B



Attachment A

The sample of Morro Bay wastewater collection lines reviewed included approximately 8,065 feet, or approximately 1.52 miles of pipe. Table 1, below, provides a summary of findings. Defects were identified by Richard Sadowski, certified CWEA Grade IV Wastewater Collection System Operator, one of the appellants of the 1840 Main Street project.

Table 1: Findings From Independent Review of Sample Tapes

Type of Defect/Problem	Total # of Occurrences
Offset Joints	589
Separated Joints	163
Dislocated joints	16
Cracked areas	59
Major breaks	2
Root Intrusion in joints	About 369 feet of pipe affected
Significant structural damage*	2
Bellies/Dips (sagging pipes)	45
Areas of debris	8
Areas of grease buildup	11 (7 are in sewer main connections)
Areas of significant H_2S gas	6
Bad lateral connections	5
Areas where lateral connections are too close together	1
Manholes with missing pan	2

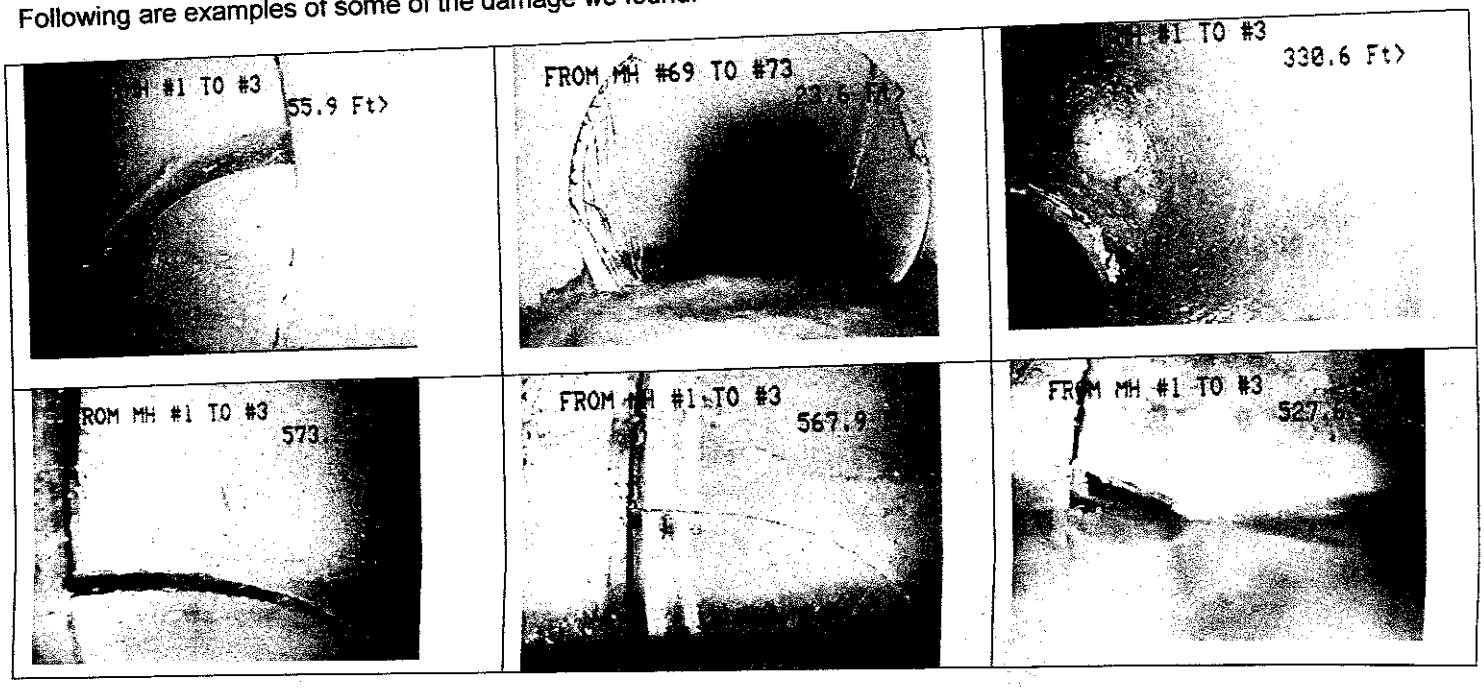
*type unspecified

Most of the lines lie above, and in close proximity to the water table, allowing for significant exfiltration of sewage into the ground water.

If we look only at offset joints, we find that, given our totals of 589 offsets, with 8,065 feet of pipe inspected, we have on average an offset joint every 13.7 feet.

If we now take the number of separated joints, 163, and adjust for the fact that 49 joints have both separation and offset, we now have 114 more defective joints.. Adding this figure to the 589 joints with offset, we now have a total of 703 defective joints. Now, given our total 8,065 feet of pipe inspected, we have an average of one defective joint every 11.4 feet.

Following are examples of some of the damage we found.



Attachment D

Document Details Report
State Clearinghouse Data Base

SCH# 2005071022
Project Title Mixed Use Retail / Office Building wtih Drive Thru Endcap
Lead Agency Morro Bay, City of

Type Neg Negative Declaration
Description Two story multi-retail building with second story towers for storage or office use and a drive thru endcap.

Lead Agency Contact

Name Mike Prater
Agency City of Morro Bay
Phone (805) 772-6261 **Fax**
email
Address 955 Shasta Avenue
City Morro Bay **State** CA **Zip** 93442

Project Location

County San Luis Obispo
City Morro Bay
Region
Cross Streets Sunset Avenue and Main Street
Parcel No. 068-324-019
Township **Range** **Section** **Base**

Proximity to:

Highways 1
Airports
Railways
Waterways
Schools Del Mar Elementary
Land Use Mixed Use / MCR / R-4 (SP) / Mixed Use Area F

Project Issues Aesthetic/Visual; Air Quality; Archaeologic-Historic; Drainage/Absorption; Geologic/Seismic

Reviewing Agencies Resources Agency; Department of Fish and Game, Region 3; California Coastal Commission; Department of Parks and Recreation; Department of Water Resources; California Highway Patrol; Caltrans, District 5; Department of Health Services; Native American Heritage Commission; Regional Water Quality Control Board, Region 3

Date Received 07/07/2005 **Start of Review** 07/07/2005 **End of Review** 08/05/2005

Note: Blanks in data fields result from insufficient information provided by lead agency.

slopes, located across Main Street and the Highway 1 onramp, would not be affected by the proposed project. Therefore, no significant impacts would occur in association with landsliding or other forms of slope failure.

b. The project site is currently paved. Natural topsoil material was likely removed during grading and removal for the service station. Therefore, no impacts would occur in association with loss of topsoil. However, demolition and soil excavation activities would result in temporary exposure of surficial soils to wind and water erosion, especially if completed during the rainy season (i.e., November 15th to April 15th). Impacts would be potentially significant but feasibly mitigated.

c. See response to a-ii and a-iv.

d. It is unclear whether expansive soils are present beneath the project site. However, no permanent structures that might be adversely impacted by expansive soils would be constructed as part of the project. Therefore, potential expansive soil impacts would be less than significant.

e. Neither septic tanks or alternative wastewater disposal systems are proposed in association with the project; therefore, no impacts would occur.

Mitigation and Residual Impact:

1 A water truck shall be used for dust suppression to prevent wind erosion during soil excavation and demolition activities. If these activities are completed during the rainy season (i.e., November 15th to April 15th), an erosion control plan identifying measures such as silt fences, hay bales, and/or straw wattles shall be prepared and implemented during construction to prevent surface water induced erosion of on-site soils. In addition, areas remaining unpaved subsequent to demolition shall be revegetated or covered with gravel immediately following demolition activities to prevent further erosion.

Implementation of this mitigation measure would reduce potentially significant erosional impacts to a level of less than significant.

Monitoring: This measure shall be included as a note on the project grading plan. The Public Services Department shall review and approve the grading plan, and if construction occurs during November 15th to April 15th, the erosion control plan prepared by the applicant/property owner, prior to land use clearance for grading. The Department shall monitor implementation of proper dust suppression and erosion control measures during demolition and soil excavation activities, and subsequently until completion of revegetation.

7.HAZARDS/HAZARDOUS MATERIALS Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				X	
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X	
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X	
d. Be located on a site which is included on a list of hazardous materials sites complied pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment?				X	
e. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X	
f. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				x	

Environmental Setting

Methyl tertiary butyl ether (MTBE) has been detected in subsurface soils and groundwater in the vicinity of the subject Shell service station. MTBE is a gasoline additive that has been used extensively across the United States since approximately 1992. MTBE is highly soluble in groundwater and capable of migrating off-site up to one mile from leaking UST sites. Early subsurface soil and groundwater sampling completed at the old Shell station indicated that the highest concentrations of MTBE was present along the northern portion of the USTs, located in the southwest portion of the site. Soil contamination appeared to be confined to the perimeter of the Shell Station; however, MTBE-impacted groundwater had migrated approximately 100 feet off-site to the southwest, to the vicinity of the SH 1 northbound onramp. An interim groundwater remediation system was constructed under the emergency permit followed by a permenant remediation system which is currently operating.

Soil and groundwater remediation had also been established under the emergency permit. Soil that appeared to be impacted with petroleum hydrocarbons during UST (and associated piping) removal had been excavated and disposed off-site. Groundwater remedial activities include installation of additional monitoring wells, groundwater pump and treat, soil vapor extraction, and installation of an injection well to form a hydraulic barrier.

Impact Discussion:

a & b. The proposed project would not create a significant hazard to the public or the environment, as reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment would not occur.

c & d. The project site is located approximately one-quarter mile east of Morro Bay High School. Removal of contaminated soils has already occurred under the emergency permit. Therefore, impacts would be less than significant.

e. The proposed project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. Therefore, impacts would be less than significant.

f. The proposed project would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires. Therefore, impacts would be less than significant.

8. HYDROLOGY/WATER QUALITY Would the project:	Significant	Unknown Potential Significant	Potential Significant And Mitigated	Not Significant	Impact Reviewed in Previous Document
a. Violate any water quality standards or waste discharge requirements?				X	
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?				X	
c. Substantially alter the existing drainage pattern on the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on or off-site?				x	
d. Substantially alter the existing drainage pattern on the site or area, including through the alteration of the course of a stream or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?				X	
e. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?			X		
f. Otherwise substantially degrade water quality?			X		
g. Place housing within a 100-year flood hazard area as mapped on a federal flood hazard boundary or flood insurance rate map or other flood hazard delineation map?				X	
h. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?				X	

The "Morro Basin Nitrate Study": Issues and Concerns

Richard E. T. Sadowski and **Marla Jo Bruton**
B. S. Mechanical Engineering;
CWEA Grade IV Wastewater
Collection System Operator
Investigative Journalist

With technical assistance from Brian Stedjee

April, 2008

Table of Contents

Background

In early March, 2008, a rash of newspaper articles and television news spots told of concerns that Morro Bay's wells were being contaminated by nitrates from fertilizers used by local farmers. Cited as evidence was the "Morro Bay Nitrate Study", done for the City by Cleath & Associates and published in December, 2007.

We were concerned that the study appeared to have failed to appropriately consider and study the possibility that Morro Bay's own sewage, exfiltrating from damaged lines, was a major factor in the nitrate contamination of the wells, and noted an apparent lack of rigor in the water testing procedures used by the consultants.

Our own qualifications for undertaking a review and critique of the Cleath study include expertise in mechanical engineering (including fluid dynamics), wastewater collection system management, wastewater treatment methods, State and Federal clean water laws, and investigative journalism. Our expertise does not include chemistry.

We gratefully acknowledge the technical assistance we received from chemist Brian Stedjee, who reviewed the study and provided technical information related to those portions that we were not qualified to analyze. Technical information provided by Mr. Stedjee has been incorporated into our discussions of isotopes and isotopic analysis, zeolite, and ion exchange, chemical makeup of various nitrogen compounds, including fertilizers, depletion of chloride and sulfide ions, ability for exfiltrated wastewater to carry nitrates from solid waste into the soil, and the absence of a connection between methyl tertiary butyl ether (MTBE) and nitrogen .

Summary of Findings

We believe that the findings presented in the "Morro Bay Nitrate Study" are based, in large part, upon invalid assumptions, inadequate study of major potential nitrate contamination sources, and in some cases, faulty "science". We believe that the study totally fails to establish any reasonable proof that agricultural operations are the primary source, or even a significant source, of the nitrates in Morro Bay wells.

The Executive Summary of the study states, in part,

> *"The purpose of the study was to evaluate potential sources of dissolved nitrate contamination in ground water at the well field along Highway 1. Potential sources include agricultural and turf fertilizers, private septic system discharges, sewer exfiltration, animal operations, and miscellaneous sources. The results of this study indicate that the main source of nitrate contamination in ground water at the City's Highway 1 well field is from nitrogen fertilizer applications associated with vegetable farming operations in the lower Morro Valley."*

We disagree, based upon what we believe are major weaknesses and errors in the study, including:

- **Failure to consider the possible impact of Bioxide use at Cayucos Lift Stations.** The consultants failed to include in the study (probably because they were unaware of it) a major potential source of nitrate contamination: the Bioxide used to treat wastewater in Cayucos lift stations. Excess Bioxide could have entered the ground water through exfiltration from the Main Street trunk line. Bioxide is composed primarily of calcium nitrate – a commonly used synthetic fertilizer.
- **Insufficient study of sewer exfiltration as a cause of well contamination.** Sewer exfiltration was not appropriately examined and considered as a major source of nitrate contamination. Sewer exfiltration was dismissed as unlikely to be a significant nitrate source based on what we consider completely invalid grounds, and insufficient study. Specific problems include the following:
    - An out-of-context reference to a study, was used to back up the assumption that exfiltration amounts are minimal.
    - The hydrogeology of areas outside the Morro Basin was not discussed or evaluated, in terms of potential for migration of sewage-contaminated groundwater to the aquifer from other parts of Morro Bay.
    - A simplistic conclusion regarding exfiltration when sewer lines are below the water table was taken. It is clear from basic principles of fluid dynamics that exfiltration can and does occur in wet conditions under some circumstances, but this was not considered.
- **Errors and omissions in nitrate isotope studies.** Nitrate isotope studies included in the report neither prove NOR disprove the consultants' assertions and conclusions. Problems we identified include the following:
    - Nitrate isotope values recorded are, at best, inconclusive; are not consistent with nitrate fertilizer.
    - Only the wells were included in the study. Lab reports show no isotopic studies for the samples of water taken from the Morro Valley or from the wastewater collection system; thus no comparison of the Nitrogen and Oxygen isotopic signatures of the samples from the three locations was done.
    - The study contained no discussion of types of nitrogen fertilizers used by the farmers. Nitrates from synthetic nitrate fertilizers will have a different isotopic "signature" than nitrates from fertilizers derived from natural sources, the latter being similar to the isotopic "signature" typical of nitrates in sewage.
    - The study includes questionable statements and assumptions, including the applicability/value of ^{18}O isotope analysis, and a false and misleading statement regarding exfiltration of ^{15}N isotopes.
- **Problems in discussions of agricultural fertilizer applications.** This section of the document includes unsupported and potentially erroneous statements. Problems we identified include the following:

- Failure to cite sources of data used
- An apparently invalid statement regarding an alleged role of MTBE

- **Contradictions between the Cleath study and nitrate level reporting to residents.** Statements regarding the timing of spikes in nitrate contamination of the wells appear inconsistent with Morro Bay's past "state of the water" reports. The Cleath study asserts that nitrate levels in the wells began to exceed standards for drinking water in 2002. However, a review of past reports indicates that no such problem was reported until 2006.

All of these issues will be covered in depth in subsequent sections of this report.

Failure to Consider Possible Impact of Bioxide Use in Cayucos Lift Stations

Bioxide Use Began in 2005

In the minutes of the August 17, 2005 Cayucos Sanitary District Board meeting is item 8: "Consideration to approve Bioxide treatment program for use at lift stations 2 and 5". The minutes indicate that the CSD approved a motion to modify the budget to allow for the implementation of the Bioxide program to control odor problems associated with hydrogen sulfide, commonly referred to as "sewer gas".

The minutes for the CSD's September 21, 2005 Board meeting, describe a report that says,"the Bioxide injections appear to be greatly reducing any odors apparent at the lift stations, and that staff have removed the Biofilters along Main Street in Morro Bay and have discontinued use of Ferrous Chloride at Lift Station 5."

We have confirmed that the Bioxide program is still in place in Cayucos. According to a former employee, Bioxide is injected into the wastewater in the lift stations just as the wastewater is pumped out of the stations and into the force mains. There is also a means for workers to inject additional Bioxide "on demand."

The Bioxide Process

Our research indicates that the Bioxide process involves the application of a nitrate solution to wastewater. The process uses naturally occurring bacteria to biochemically oxidize dissolved sulfide.

Bioxide is primarily composed of calcium nitrate, a synthetic nitrate compound which is also used as a fertilizer. If too much is used, and all of the calcium nitrate is not consumed in the chemical reaction, it will remain in the sewer lines and may exfiltrate into the soil and ground water.

Bioxide Nitrates versus Nitrates from the Farmers' Fertilizers

The Cleath study asserts that the primary source of nitrate contamination of the wells is most likely fertilizer from local farms. We assert that established science indicates that the chemical signature of the nitrates in synthetic nitrogen fertilizers that may be used by the local farmers, and the chemical signature of the calcium nitrates in Bioxide will be essentially equivalent. Indeed, calcium nitrate is sometimes used as a fertilizer. We further assert that the consultants did no testing that would enable them to state with any certainty which of these may be a source of the well contamination.

Detecting Bioxide Nitrates in the Wastewater Lines

We would expect that there is strong potential for excess calcium nitrate from the Bioxide to appear, intermittently, in the Main Street trunk lines - with the timing of its presence dependent upon such variables as lift station pumping schedules, flow levels, and employee intervention to add Bioxide "on demand".. Testing of the water in the Cayucos line would have to be carefully timed, and done repeatedly over time in order to determine a reasonable estimate of the amounts of any excess calcium nitrate left over from the Bioxide process.

There no discussion of any such testing in the Cleath study and, since consultants charge for their work, we consider it reasonable to assume that any and all testing done would be carefully documented in their report.

Insufficient Study of Sewer Exfiltration as a Cause of Well Contamination

Quotes From a Study Were Taken Out of Context

The Cleath report appears to make what we consider an invalid assumption – that our exfiltration rates are minimal. Citing a 2000 study by Amick and Burgess. The Cleath report says:

> *"Despite a hydraulic potential for exfiltration along Main Street when the City well field is pumping, gravity sewer leaks quickly become plugged by sewer film and settleable solids in the sewage, theoretically reaching steady-state leakage rates in approximately one hour. A research study conducted at several locations in Germany, where sewer systems are generally older and in poor condition showed that when system pressure heads are below the sewer pipe crown (typical for gravity sewers) exfiltration rates were minimal"*

We are familiar with the Amick and Burgess study, and surprised that the Cleath consultants chose to quote out-of-context material regarding the German research. In their discussion of that research, Amick and Burgess go on to state:

> *"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."*

Furthermore, in fact, the Amick and Burgess study focuses on the serious negative impacts of exfiltration, such as discharges of pathogens into residential areas, exceeded water quality standards, and risks to the health of the people living adjacent to the impacted streams, lakes, ground water, sanitary sewers, and storm sewers.

Among the examples given is an estimated exfiltration rate between 5, 649 and 6,327 "**gallons per inch diameter per mile length per day**" for one Santa Cruz location tested. This hardly sounds "minimal".

Exfiltration Potential in Morro Bay Sewer Lines

Given the condition of our sewer, we believe that there is significant exfiltration of wastewater from our lines as well, with the potential for that wastewater to flow underground to the aquifer. In prior reports, we have presented extensive evidence of the seriously dilapidated condition of the lines throughout Morro Bay.

We believe it is clear from those reports, and from numerous studies on the risks associated with exfiltration (including those in the Amick and Burgess study, "Exfiltration in Sewer Systems" which was, curiously, cited in an apparent attempt to support the idea that exfiltration was not a major problem here), that major exfiltration of sewage from dilapidated collection systems is a widespread and serious problem. The Albuquerque case study cited by Amick and Burgess "*...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.*"

We believe that the problem is also very serious in Morro Bay. It is important to note that Amick and Burgess make it clear that maximum potential for exfiltration problems exists in areas where the sewer lines lie above the water table, stating that, "*Areas with significant portions of the system above, but in close proximity to, the groundwater table are probably at greatest risk.*" This is the case for most of the lines in Morro Bay and Cayucos.

For an excellent overview of the problem, we highly recommend that concerned readers review the Amick and Burgess study, which is available online at: http://www.epa.gov/nrmrl/pubs/600r01034/600r01034.pdf

Potential for Exfiltrated Sewage to Reach the Aquifer from Areas Distant from the Basin

Content of the Cleath report section on hydrogeology was limited to a discussion of the Morro basin covering topics such as subsurface inflow through the narrows, and stream flow seepage. We found no discussion of hydrogeology related to underground water transport outside of, and in the direction of the basin, from other parts of Morro Bay. The recharge dynamics section of the report also failed to consider the potential for exfiltrated sewage migration to the aquifer from other Morro Bay locations.

Ground water, like surface water, flows from higher elevations (or pressures) toward lower elevations (or lower pressures). Groundwater flow is usually toward a groundwater discharge area, such as a stream.

According to our research, in order to determine the extent to which exfiltrated sewage can travel to the aquifer from various areas of Morro Bay, hydrogeological studies such as testing with tracer compounds and ground water flow modeling are necessary. Groundwater flow modeling is generally used to define the quantity of groundwater available or direction of dissolved contaminant migration. Tracer methodologies involve the use of chemical tracers whose migration can be followed through testing of water samples from various locations.

We reviewed several studies of well contamination to see that techniques other consultants and researchers use, and found extensive use of flow modeling to help determine how contaminants migrate in underground water. One excellent example is "Determining Sources of Water and Contaminants to Wells in a Carbonate Aquifer Near Martinsburg, Blair County, Pennsylvania, By Use of Geohcemical Indicators, Analysis of Antropogenic Contaminants, and Simulation of Ground-Water Flow, by By Bruce D. Lindsey and Michele L. Koch .

With regard to consideration of migration of water to the wells, note the following chapters in the document:

> *Simulation of Ground-Water Flow, Sources of Water and Contaminants to Martinsburg Municipal Wells , Geochemical Indicators, Source of Water , Type of Permeability Sources Based on Simulation of Ground-Water Flow , Conceptual Model , Model Design , Model Calibration , Simulation Results and Sensitivity , Zone of Contribution to Municipal Wells , Relating Simulation Results, Natural Geochemistry, and Anthropogenic Contaminants to Determine Source Areas Limitations of Data and Findings*

This study covers a wide geographic area, and includes thorough research and analysis of means for contaminants to migrate to the wells from areas other than those in the immediate vicinity. We found no indication of any such rigor in the Cleath study.

Indeed, we are convinced that the City of Morro Bay could not possibly afford a study of this scope and quality. However, we believe that more investigation is definitely needed to either confirm or deny that exfiltrated sewage is the major cause of our well contamination. Had some of the money spent on the Cleath study been spent to check for sewage pollution of our groundwater, we believe that we would be much closer to resolving the well contamination problem.

Therefore, we believe it is impossible, based upon their very limited research, for the consultants to state with any certainty whatsoever whether exfiltrated sewage can, or cannot reach the Morro Basin aquifer from various areas of Morro Bay. This includes exfiltrated sewage containing excess calcium nitrate from Cayucos' Bioxide use.

Overly Simplistic Treatment of Potential for Exfiltration in Wet Conditions

In a discussion of exfiltration potential, authors of the Cleath study state,

> *"There was little opportunity for sewer exfiltration in the vicinity of the City well field in 2005 due to elevated water levels"*

and, in the same paragraph,

"Water levels declined in the well field area, compared to 2005, and provided an opportunity for exfiltration from sewer pipes along Main Street".

Although, under most normal conditions, we would not expect exfiltration from sewer lines that are below the water table, it can, and does happen.

During peak daily flows (5-9 am and 5-8 pm approximately) the downtimes between pump cycles at the lift stations are of shorter duration and the pump run times are longer. In wastewater conveyance systems with "severe bellies", or "dips" (low points in the line), this causes minor surcharging in those areas.

As noted in some of our previous reports, Morro Bay's conveyance system is full of "severe bellies", where wastewater tends to collect and stand. During surcharging events, pressure in those areas is increased and may exceed the pressure exerted by water present outside the line. In those situations, exfiltration can and does occur through cracks and other openings above the mean flow line, even though the line is below the water table.

It is important to note that "bellies" in sewer lines tend to form in areas where there is significant exfiltration of sewage. The constant soaking of the soil underlying the line causes the soil, and subsequently the line, to sink.

In addition, the consultants themselves confirm that there is a hydraulic potential for exfiltration along Main Street when the City well field is pumping, although they do then use an out-of-context quote as a basis for the claim that gravity sewer leaks "quickly become plugged by sewer film and settleable solids".

Unsupported Mixing Calculation Assumptions and Conclusions

On page 18, we find Table 5, titled, "Mixing Assumptions for Sewer Exfiltration". Raw data, formulae, and actual calculations are not provided. In addition, beneath the table is this statement, "Mixing requirements assume all ammonia converts to nitrate with no denitrification".

In order for this assumption to be correct, a specific type of bacteria, required for this conversion, must be present. No evidence is presented to establish the presence of these bacteria in the locations and numbers required.

It is further stated that,

"Figure 12 presents the type of water that would be expected (without ion exchange) from mixing 30-55% wastewater (Cayucos, Morro Bay, and WWTP influent sources) with historical ground water at MB-3"

However, no evidence is presented to rule out the presence in the soil of zeolite, a natural ion exchanger.

If zeolite is present in the soil, there will be ion exchange. 48 naturally occurring zeolites are known. Zeolites slowly crystallize in post-depositional environments (shallow marine basins), or form where volcanic rocks and ash layers react with alkaline groundwater.

Also on page 18 is the statement,

"Chloride and sulfate anions are relatively conservative in solution, however an evaluation of the anion mixing results shows that for the 30-55 percent wastewater mixtures to shift toward the composition of nitrate-impacted water at the City well field, there would also need to be a significant depletion in chloride (>50percent) along with enrichment of sulfate and bicarbonate in solution (Figure 13). This would not be part of a natural ion exchange process near the well field"

Chloride and sulfate are both negative ions. If one is depleted, then the other should be depleted as well.

Failure to Appropriately Address the Role of Ammonia and Urea in Exfiltrated Sewage

Nitrogen can be found in nitrate (NO_3-), ammonia (NH_3), or urea (N_2COH_4). Bacteria can produce nitrates from ammonia and urea found in sewage. This may, or may not occur when these compounds are exfiltrated into the soil, depending on type and amount of soil bacteria present, and conditions. We found no discussion of this issue in the study.

Errors and Omissions in Nitrate Isotope Studies

Basic Principles of Isotopic Nitrate Studies

The consultants used isotopic ratio analysis as a way of identifying nitrate sources. While the unfamiliar terminology may seem daunting, the principle involved is a simple one.

Chemical elements exist in multiple forms with different masses. These different forms are referred to as "isotopes". The difference in mass is due to different numbers of neutrons in the nucleus of the atom. Different isotopes are denoted by mass number, such as ^{12}C and ^{13}C. While isotopes of the same element have the same chemical properties, their masses can affect how they are used in chemical reactions. The consultants used nitrogen and oxygen isotopes as part of their attempt to trace the source of nitrates in the wells.

Nitrogen atoms have seven electrons, and seven protons. There are 2 stable nitrogen isotopes (^{15}N and ^{14}N). Ratios of $^{15}N/^{14}N$ are reported as $\delta^{15}N$. ("δ values", in units of permil = ppt = ‰). The ^{14}N isotope has 7 neutrons in the nucleus. The ^{15}N isotope has 8. The mass of "stable" isotopes does not change. They do not lose or gain neutrons.

Oxygen has 8 protons and 8 electrons. Oxygen isotopes are also used in studies to determine the source of nitrates. There are 3 stable oxygen isotopes (^{18}O,^{17}O,^{16}O), having 10, 9, and 8 protons in their nuclei, respectively. Ratios of $^{18}O/^{16}O$ are reported as $\delta^{18}O$. Ratios of $^{17}O/^{16}O$ are reported as $\delta^{17}O$.

The nitrate ion is made up of one nitrogen atom, and three oxygen atoms, and nitrate ions may contain any of the stable nitrogen and oxygen isotopes. It has been found that nitrates originating from synthetic fertilizers, explosives, and nitric acid have proportionately less ^{15}N in source-area ground water, than does nitrate from sewage contamination. As previously noted, these relative amounts of isotopes can be measured in the form of isotope ratios; in this case, $^{14}N/^{15}N$. An "isotope ratio mass spectrometer" (IR-MS) is used to identify isotopes, in determining the isotopic ratio of a sample.

During biological processes (e.g., assimilation, nitrification, denitrification), the lighter isotope (^{14}N) ends up being concentrated in the products while the heavier isotope (^{15}N) ends up being concentrated in the residual reactants. Hence, during the reaction $NO_3 \rightarrow N_2$, the resulting N_2 has a lower □^{15}N than the residual NO_3.

Isotopic analysis is widely used. Under the right conditions, and if the appropriate scientific methods are followed, it can be a useful tool in determining sources of nitrate contamination. However, there are many complicating factors. For example, as stated by Carol Kendall, author of "Tracing sources of agricultural N using isotopic techniques: the state of the science ",

> *"Biological fractionations can make it very difficult to identify sources and quantify mixing proportions."*

The following table is quoted from "Nitrate Forensics" by William E. Motzer, Ph.DI,

"TABLE 1
Typical $\delta_{15}N$ and $\delta_{18}O$ Values in Dissolved Nitrate (NO_3-) From Different Nitrate Sources

Potential Contaminant Source	$\delta_{15}N$ (‰)	$\delta_{18}O$ (‰)
Commercial fertilizer	–4 to +4	+18 to +26
Animal or human waste	> +10	–4 to +12
Precipitation	–3	+18 to +60
Organic nitrogen in soil	+4 to +9	+1 to –4

Where: δ (isotope) = values in per thousand (‰)"

We have seen some variations in the ranges presented by various researchers; the variations are generally minimal. This set of expected values is typical.

Testing of Samples

Appropriate samples for testing are critical to the integrity of any scientific study such as the one done by Cleath and Associates. The expression "garbage in, garbage out", more commonly associated with computers, applies equally well to this process. If samples are not taken from the right places at the right time, handled correctly, and tested appropriately, the test results will be invalid.

In the body of the Cleath report, on page 15, is the following table:

Table 4
Nitrate Isotope Results
Highway 1 Well Field

Sample ID	$\delta^{15}N$ (‰)	$\delta^{18}O$ (‰)
MB-15	7.9	16.0
MB-14	7.1	12.9
MB-4	8.8	13.1
MB-3	10.0	13.6

Interestingly, we find a slightly different version in Appendix E: Laboratory Reports for Ground Water and Surface Water:

LAB NUMBER	SAMPLE DESCRIPTION	$\delta^{15}N$ ‰	$\delta^{18}O$ ‰
40650-1	MB-15	7.9	16.0
40650-2	MB-14	7.1	12.9
40650-3	MB-4	8.8	13.1
40650-4	MB-3	10.0	13.6
40650-5	Fertilizer	0.7	13.8
Analytical Precision (1-sigma)		0.3	0.2

Clearly, the significant data in the Appendix, but not the table in the body of the report, is the data on the fertilizer sample tested by the laboratory. Note that the nitrogen isotope readings from the wells and the reading from the fertilizer sample diverge widely

It has been found that nitrates originating from synthetic fertilizers, explosives, and nitric acid have proportionately less ^{15}N in source-area ground water, than does nitrate from sewage contamination." The data in the above table would, therefore, seem to "fly in the face" of assertions that nitrate contamination in the wells comes from fertilizer. The tested fertilizer sample does, indeed, have a very low ^{15}N value, and is thus consistent with known values for fertilizer. On the other hand, the well water samples have much higher ^{15}N values, suggesting to us that fertilizer cannot be identified as the chief cause of the contamination.

Cleath study authors attempt to justify the data by suggesting possible reasons for the divergence of the data from their assertion that the well contamination is primarily caused by agricultural operations. For example, on page 19, they state,

> *"Another aspect of isotope analysis that results in overlapping ranges of $\delta^{15}N$ for various sources is isotope fractionation. For example, microbial denitrification can enrich the 15N composition of residual dissolved nitrate and lead to nitrate derived from fertilizer having $\delta^{15}N$ values close to sewage nitrogen (Jeffrey et al, 2002). Therefore, the range of $\delta^{15}N$ in nitrate values at the City well field (+7 ‰ to +10 ‰) **could be** accounted for by sewer exfiltration without significant ammonia volatilization and denitrification, by a mixture of nitrate input from sewer exfiltration and synthetic fertilizers with ammonia volatilization and/or denitrification. "* (emphasis, ours)
>
> and
>
> *"Isotope fractionation during denitrification also enriches $\delta^{18}O$ of nitrate values. The proportion of $\delta^{15}O$ enrichment to $\delta^{18}O$ enrichment in nitrate residual during denitrification **has been found on many occasions** to be 2:1 (e.g. Kendall, 1998)* (emphasis, ours)

Note the use of the terms "*could be*" and "*has been found on many occasions....*" This, we believe, is pure speculation. Despite the speculations by the consultants, and their presentation of various theories to explain why their ^{15}N data does not fall into the expected ranges, we believe that there is insufficient evidence in the report to prove any of their theories true.

To better illustrate the discrepancies, we organized the data in our own tables, comparing the Cleath study data to standard value ranges for different nitrate sources, as found in William Motzer's paper, "Nitrate Forensics".

In this first table, we see the expected value ranges for $\delta_{15}N$ defined in the two left columns, followed by the actual readings from our wells, and from the one fertilizer sample tested.

Table A

Expected Values for Various Sources		**Actual Values found in Morro Bay Wells**				**Actual Value for the Fertilizer Sample Tested**
$\delta_{15}N$ (‰) value ranges defined in "Nitrate Forensics"		**$\delta_{15}N$ (‰) in well MB-3**	**$\delta_{15}N$ (‰) in well MB-4**	**$\delta_{15}N$ (‰) in well MB-14**	**$\delta_{15}N$ (‰) in well MB-15**	**$\delta_{15}N$ (‰) in fertilizer sample tested**
Commercial fertilizer	–4 to +4	10.0	8.8	7.1	7.9	0.7
Animal or human waste	> +10					
Precipitation	–3					
Organic nitrogen in soil	+4 to +9					

Note that there are major discrepancies. Readings for commercial fertilizer should be in the -4 to +4 range. The fertilizer sample does, indeed, fall into the specified range for commercial fertilizer. However, the readings from the wells do NOT.

In this second table, we see a comparison of expected value ranges for $\delta_{18}O$

Table B

Expected Values for Various Sources		**Actual Values found in Morro Bay Wells**				**Actual Value for the Fertilizer Sample Tested**
$\delta_{18}O$ (‰) value ranges defined in "Nitrate Forensics"		**$\delta_{18}O$ (‰) in well MB-3**	**$\delta_{18}O$ (‰) in well MB-4**	**$\delta_{18}O$ (‰) in well MB-14**	**$\delta_{18}O$ (‰) in well MB-15**	**$\delta_{18}O$ (‰) in fertilizer sample tested**
Commercial fertilizer	+18 to +26	13.6	13.1	12.9	16	13.8
Animal or human waste	–4 to +12					
Precipitation	18 to +60					
Organic nitrogen in soil	+1 to –4					

Again, there are discrepancies. None of the values for the wells (or even for the fertilizer) matches the expected range for commercial fertilizer.

Furthermore, in "Ground-water Quality Impacts from On-site Septic Sytems ", Dennis McQuillan cites the following statistics for δ15N (‰) in groundwater from a New Mexico study:

Nitrate Source	Nitrate-N (mg/L) Maximum	$\delta^{15}N$ (‰) range & mean	Number of Samples
Septic systems	53	7.6 to12.1 10.4 mean	12
Primary sewage plant	56	7.2 to12.1 9.4 mean	4

We do not find the divergence from the "Nitrogen Forensics" value range for human waste surprising, as one would expect sewage to contain many other substances.

The range of δ15N (‰) found in our wells was 7.1 to 10, with a mean (arithmetic average) of (10.0 + 8.8 + 7.1 + 7.9)/4 = 8.45. Note that these figures are very similar to those from the new Mexico study, giving credence to the suggestion that the major cause of our nitrate pollution is, in fact, not fertilizer, but sewage.

Clearly, this is insufficient evidence to make any conclusive statement, but equally insufficient, we believe, is the "evidence" that the Cleath study cites as pointing to agricultural operations as the source of the nitrate problem. It is our position that there are many more variables to be studied and considered before anyone can make a definitive statement regarding the source of the nitrates in Morro Bay wells.

That said, we believe that data in our tables A and B, above, and the New Mexico data, provide significant evidence to support our position that the isotopic studies done for the Cleath report do NOT prove that agricultural operations are the main cause of nitrate contamination in the wells – or even that they are part of the cause.

Isotopic Analysis Limited to Samples from Wells

Samples included only report of isotopic studies, and included five samples. Four water samples were taken from wells MB-3, MB-4, MB-14, and MB-15. The fifth was described simply as "fertilizer".

From the laboratory report from Zymax Forensics, found in Appendix E, and from statements in the study, we surmise that these are the only samples subjected to isotopic analysis. It does not appear that any of the samples taken from Morro Creek, Little Morro Creek, or wastewater from Morro Bay and Cayucos lines were included. Therefore, there is no means to compare samples from the three sources to better support determination of likely contamination sources.

Some Questionable Statements and Assumptions

On page 16, under the heading, "Sources of Nitrate Contamination", the list of miscellaneous sources of nitrate contamination includes "native nitrogen fixing plants". Nitrogen fixing plants (or rather the nitrogen fixing bacteria in their roots) probably "load" a lot of organic nitrogen, but not in the form of nitrates.

The following apparent errors raise some serious doubts regarding the reliability of the consultants' application of isotopic analysis.

1, Misleading statement on exfiltration of nitrate isotopes

On page 19, it is stated,

"...Furthermore, the composition of sewer exfiltration in the subsurface would not include solid waste which, according to Kendall (1998) is the specific component of sewage which is δ15N enriched."

This statement is false, and we consider it seriously misleading. Water flowing through the solids would carry the nitrates from the waste, and thus, if exfiltrated, carry them into the soil and, potentially, into the ground water. .

2. Doubts Regarding the Applicability/Value of ^{18}O Isotope Analysis

Also on page 19 is a discussion of ^{18}O. The presence of ^{18}O in fertilizer is due to use of the Ostwald process (a process for the industrial production of nitrogen oxide and nitric acid from ammonia and oxygen). Isotopic analysis to detect ^{18}O is sometimes used as a tool for determining the source of nitrates. It appears from their references to synthetic nitrate fertilizer, that the consultants are making the assumption that the farmers are using this type of fertilizer.

We found no statements within the study indicating that the consultants had any discussion with the farmers regarding the types of fertilizer used to provide nitrogen to their crops. If many of the farmers are using fertilizers produced without use of the Ostwald process , then the value of analysis of oxygen istotope ratios as a means of identifying nitrates from fertilizer will be significantly reduced.

3. Seemingly Contradictory Statements Regarding Nitrate Concentrations

On page 20, it is stated,

"...It is interesting that 50-60 percent of the average NO_3 concentration in ground water beneath the agricultural fields in the lower Morro Valley is 80-96 mg/lNo_3, which is at the upper range of concentrations measured in recent years at the well field."

However, on page 1, it is stated,

"Nitrate concentrations in ground water beneath farming operations in the lower Morro Valley have risen from an average of 34 mg/l in 1980 to an average of 160 mg/l in 2007.

If 80-96 mg/l NO_3 is "at the upper range of concentrations measured in recent years at the well field", then we must ask the question: How can nitrate concentrations have risen to an average of 160 mg/l in 2007" ?

Problems in Discussion of Agricultural Fertilizer Applications

Disconnects Between Data and Conclusions Drawn From it

On page iii of the report, we find this statement:

> *"Most of the limited ground water production at the well field now occurs during the late fall when the State Water Project shuts down for annual maintenance. Lower production reduces the amount of recharge from stream seepage adjacent to the well field, which had historically diluted nitrate concentrations coming into the area from the lower Morro Valley. Without significant dilution from stream seepage, and* ***with increasing nitrogen loading from high intensity farming in the lower Morro Valley, nitrate concentrations at the City well field began exceeding the drinking water standard in 2002, and are still increasing.***

On page 6, it is stated,

> *"the short mild winters of the central coast allow farming on a year-round basis. The harvested acreage may be several times the farmed acreage due to "multiple cropping".*

However, in Table 2, "Harvested Acreage Adjustments 1997-2007 Morro/Little Morro Creek Valleys", we find the following data given for total "Harvested Acreage (adjusted for multiple crops)

1977	1984	1992	1995	2001	2007
293	601	1069	1505	1319	1314

It is noted that, "harvested acreage adjustments are for fertilizer use estimates only, not for water use. Clearly, these numbers show that the harvested acreage has gone down significantly since 1995, and remained essentially constant since 2001. It has NOT been increasing.

The consultants clearly state that their data is "adjusted for multiple crops". Therefore, we see a problem in the assertion that there is "increasing nitrogen loading from higher intensity farming".

Fertilizer Applications as Sources of Nitrate Contamination

On page 21, within the "Source of Nitrate Contamination" section, under the heading, "Agricultural Fertilizer Applications, we noted the following issues:

Missing Sources

Many numbers are used in the discussions on page 21 without any reference to their source(s). It is our position that a serious scientific study must provide sources for data, and formulae used for any calculations done to support study conclusions.

Apparently Invalid Statement Regarding MTBE and Nitrates

On page 21, it is stated,

> *"The change in recharge dynamics at the City well field is due to reduced well field production following state water deliveries and dissolved MTBE plume detection in groundwater, which has magnified the impact of increased nitrogen loading to the groundwater basin."*

MTBE (methyl tertiary butyl ether) has nothing to do with nitrogen, and nothing to do with nitrogen loading. We believe that, unless the statement quoted above is a VERY badly-constructed sentence, and one that leaves out critical information, it implies a serious lack of understanding of basic chemistry.

Contradictions Between the Cleath Study and Nitrate Level Reporting to Residents

We have seen numerous news reports stating that, in 2006, nitrate levels in Morro Bay wells began to exceed standards for drinking water. In the November 15, 2006 Public Works Advisory Board (PWAB) meeting, it was announced by Bill Boucher that, "the City was having a problem with its drinking water. Tests done today show the Nitrate level at 48 mg/liter and the State and Federal limit for Nitrates is 45 mg/liter."

We have been unable to locate any evidence that any City employee made any such announcement prior to 2006, or that residents were ever provided any warning of such a problem prior to that time. A search of all City Council meeting minutes for the years 2002 through 2005, using the search term "nitrate" found only one reference.

In the September 22, 2003 City Council minutes, we found "*D-1 Approve in Concept a Multi-Party Groundwater Agreement Within the Chorro Valley; (Public Services)*" Recorded comments by Bill Boucher included this statement:

> *"Chorro potable water quality has historically been better than Morro wells, significantly lower in nitrate and salt levels."*

There was no statement recorded regarding nitrate levels in Morro Bay wells exceeding MCL levels.

Yet, on pages 11 and 13, the Cleath study states that nitrate concentrations in Highway 1 wells MB-3 and MB-4 began exceeding the state Maximum Contaminant Level (MCL) for nitrates in 2002. This appears to be a serious contradiction.

Nitrate Data Reported to Residents, 2002 through 2005

We also reviewed the annual water quality report sent to residents in the years 2002 through 2006. In the 2005 report, we found this statement: "Overall, the wells had a risk assessment of low to medium."

Specific nitrate data included in the 2002 -2005 reports was as follows:

				State Water		Well Water			
SUBSTANCE (UNITS)	YEAR SAMPLED	MCL	PHG (MCLG)	AMOUNT DETECTED	RANGE LOW HIGH	AMOUNT DETECTED	RANGE LOW HIGH	VIOLATION	TYPICAL SOURCE
Nitrate (as nitrate, NO_3) (ppm)	2002	45	45	2.86	-	**18.8(a)**	**7.3-41(a)**	No	Runoff and leaching from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
	2003	45	45	3.21	NA	**19**	**13-25**	No	
	2004	45	45	2.8	1.2-4.8	**19**	**2-34**	No	
	2005	45	45	4.44	1.8-7.6	**22.0**	**8.5-32**	No	

(a) Measured at the Kings Street tanks after blending with State Water and/or Desal Water

Note the range of nitrate reported for well water: 2 – 41 ppm. Yet, on page 11 of the Cleath study, we find this:

> *"In 2002, nitrate concentrations in ground water from two of the City's Highway 1 wells (MB-3 and MB-4) began exceeding the state Maximum Contaminant Level (MCL) for drinking water of 45 mg/l NO_3 on a seasonal basis. In the last two years, NO_3 concentrations at the other two Highway 1 wells (MB-14 and MB-15) have also begun exceeding the MCL."*

Note (a) is of particular interest. The "well water" nitrate levels were not measured at the well, and were measured after blending with other water supplies.

On page 13, we find:

> *"Nitrate concentration peaks between 2002 and 2006 coincide with full scale production at the well field, which occurs annually around November during the State water Project shut downs. Historically, nitrate concentrations in November were in decline, rather than peaking"*

It appears that what the consultants are telling us is that nitrate concentrations in well water exceeded standards for safe drinking water every year from 2002 through 2006, and that they were at their worst while we were using the wells. YET, the City's water quality reports to residents said everything was fine.

Conflicting Assertions Regarding Likely Sources of Well Contamination

In the 2005 Annual Water Quality Report, we find the following statements:

> *"The Morro Basin wells are considered most vulnerable to the following activities not associated with any detected contaminants: gas stations, known contaminant plumes."*

> *"The Chorro Basin wells are considered most vulnerable to the following activities not associated with any detected contaminants: agricultural drainage, septic systems, wells (agricultural, irrigation), and other animal operations."*

Yet, the Morro Basin wells are the ones that the Cleath study claims have been contaminated by nitrates from agriculture.

Who Knew What, When?

We assume that the City has not employed Cleath & Associates to study our well water since 2002. This seems to us to imply that the consultants must have been given the data for years 2002 – 2006 by someone working for the City. From the September 22, 2003 minutes, it is clear that at least one City employee had some awareness of nitrate levels in Morro Bay wells. Otherwise, we must question how he could make the statement that the Chorro wells contained less nitrate. The note regarding nitrate level measurement for the "2002 Consumer Confidence Report is, we believe, also a significant indicator that staff knew that well water nitrate levels had reached unsafe levels. We can think of no other reason to measure well water nitrate levels "at the King Street tanks after blending with State Water and/or Desal Water"

Is the Data Source Used by Consultants Correct?

One would think that, as soon as City staff learned that the nitrates in the wells had begun to exceed the MCL level, an immediate investigation would have been launched to identify the source of the problem, followed by prompt corrective action. However, we find no evidence of any such actions by our City government.

Therefore, we must conclude that one of the following is true:

1. The Cleath consultants received inaccurate information
2. The consultants made an error
3. City staff responsible for ensuring the quality of well water failed, for some reason, to tell residents and, evidently, the City Council about the problem.

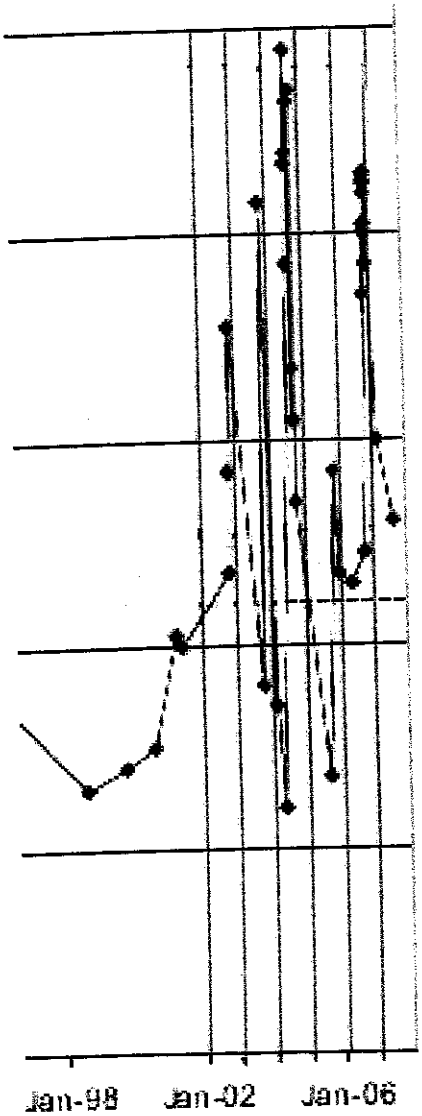
We believe that number 3 is correct, but would still like to see the consultants' source data.

Suggestions for Further Investigation

As previously stated, we believe that additional hydrogeology studies and ground water testing are necessary. We also believe that it is advisable to identify and analyze events that could have led to the sudden spikes in nitrate levels that began to occur in 2002. In this section, we present an example, and our analysis of its potential for causing the spikes. We wish to emphasize that this is only a theory, and that appropriate tests would be needed to determine its validity.

The Annual Contamination Pattern

Figure 4 from the Cleath study shows spikes in the nitrate concentrations in well MB-3. Here, we have expanded the detail for a portion of the chart, focusing on the period from January, 2002 to January, 2006. We will assume that the graph reflects the source data to a reasonable degree of accuracy.



Each of the vertical lines on this image represents the month of January. Note that the peaks in nitrate contamination are occurring just before January of each year. The pattern is slightly different for 2005, but in general, it appears reasonably uniform from year to year.

The pattern of testing (with tests identified by the dots on the graph) is obviously not regular. In addition, we suspect that the original graphing of nitrate levels in straight lines is an over-simplification of actual level variations. We consider it likely that if testing were done weekly, graphing of the levels would show curved lines. This is analogous to the results of drawing a picture using the "connect-the-dots" method. Nevertheless, the graphing done by the consultants should serve to illustrate the points we wish to make.

According to Bill Boucher's August 8 "Status Report on Water Resources Availability and Water Conservation Plan". State Water has an annual 2-week maintenance shutdown period every November

We would expect that the City staff would not wait until the State Water is shut off before starting up the wells, and that some type of testing or other preparatory work would require that some pumping be done prior to switching our water system from State to well water.

We find it extremely interesting that the spikes shown on the graph appear to correspond very nicely to the annual State Water shutdown period. Indeed, on page 13 of the Cleath study, it is stated,

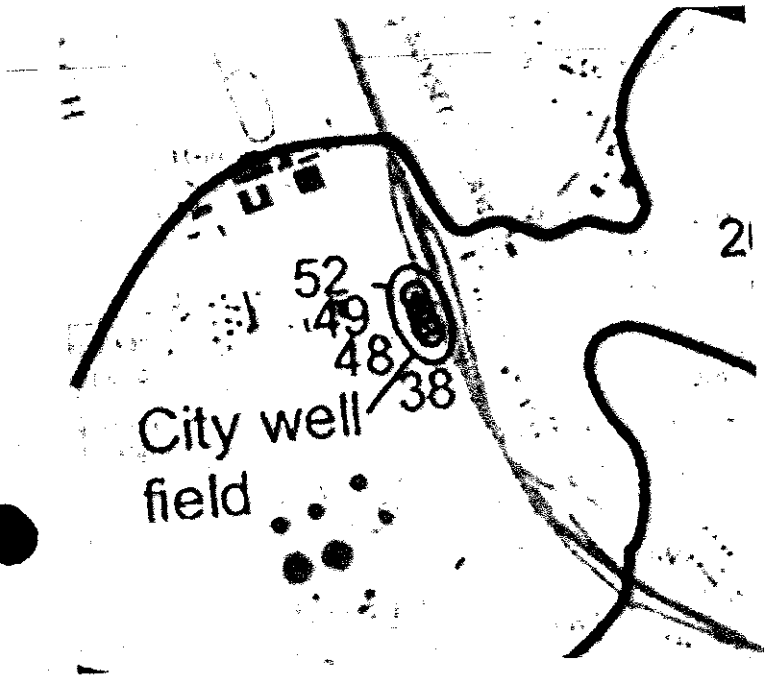
"Nitrate concentration peaks between 2002 and 2006 coincide with full-scale production at the well field, which occurs annually around November during the State Water Project shut downs. Historically, nitrate concentrations in November were in decline, rather than peaking"

This timing supports our belief that the increased nitrate contamination of the wells in recent years is NOT due to a sudden and extremely radical increase in fertilizer usage beginning in 2002. We believe the significant nitrate level spikes each year are due to an increased inflow of exfiltrated sewage into the aquifer.

Potential for Contamination by Exfiltrated Sewage in Groundwater

On page 2 of the Cleath study, it is noted that recent studies have concluded that the basin aquifer is "unconfined to leaky-unconfined". Unconfined aquifers are sometimes also called "water table aquifers, because their upper boundary is the water table.

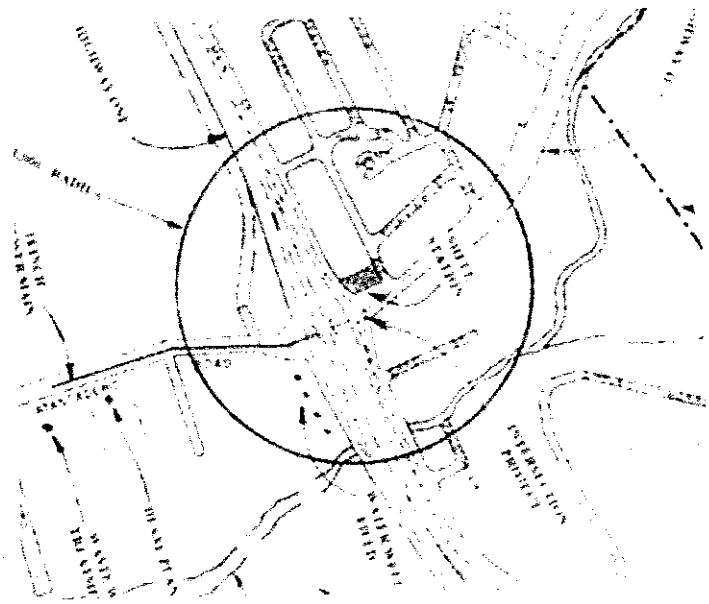
From 2000 through 2002, there was considerable excavation in an area adjoining the well field. We note from the maps provided in the Cleath study that the area where the excavation occurred appears to be directly on one of the boundaries of the aquifer. It is well known, as well as intuitively obvious, that shallow aquifers can cross-contaminate deeper aquifers through penetration of the boundary between them. We submit that it is possible, and even likely, that the excavation breached the boundary of the basin aquifer, providing a path for exfiltrated sewag to enter the basin aquifer, and thus to contaminate our wells.



In this image, a detail of a map included in the Cleath study, the dark lines indicate the boundaries of the aquifer in the areas near Highway 101.

Note the location of the boundaries in relation to area streets; in particular, the intersection of Atascadero Road and Main Street, where the old Shell station was located. Tanks at the station were found to be leaking MTBE.

In the diagram below, quoted from a City document entitled, "The City of Morro Bay and MTBE", a shaded rectangle marks the location of the station.



It appears to us that the station sat directly over the aquifer boundary.

The City document stated, in part,

"In early 2000, soil borings samples from the Shell station site at 1840 Main Street revealed high concentrations of MTBE in the soil and groundwater. In March 2000, The RWQCB required the Shell station owner Equilon/Equiva to install monitoring wells and to conduct groundwater and soil sampling on the Shell site and off-site. The results of the sampling conducted from May through August 2000, show the MTBE contaminant plume to originate on the Shell service Station site and extend west under Main Street and Hwy 1."

Also in this City document, was this statement:

"The City of Morro Bay and DHS are concerned that pumping the wells will influence the MTBE plume west of the Shell Station, causing the plume to move toward the Morro Basin wellfield"

Considerable remediation was done in an attempt to control the MTBE plume and prevent it from entering the wells. In a staff report for the May 30, 2002 regular meeting of the Central Coast RWQCB, we found this information on some of the work done:

> *"On January 24, 2002, Shell removed the inactive UST system to evaluate the source of the release (e.g., piping, fuel dispenser, etc.). Soil sample information and inspection did not pinpoint the exact source of the MTBE leak. In February 2002, Shell placed a slurry of oxygen release compounds (ORC□) in the saturated soils beneath the USTs and in the first few feet of gravel used to backfill the UST excavation. The ORC□ was placed in the UST excavation to stimulate bioremedation to remove MTBE and TBA in this area. In addition, two tank pit-monitoring wells (TP-N and TP-S) were installed within the former excavation to monitor the effectiveness of the ORC□ and water quality. Two extraction wells adjacent to the UST excavation (MW-7 and IW-1) were taken offline of the extraction system to allow the ORC□ to remain in place. Currently, groundwater extraction is from three offsite wells, IW-4, IW-5, and IW-6. Groundwater will continue to be sampled for petroleum hydrocarbon constituents and field tested for water quality parameters (e.g., dissolved oxygen, pH, etc.) on a bi-monthly basis in selected monitoring wells while the groundwater extraction system remains in operation."*

Could the extensive excavations and borings done here, on the boundary of the aquifer, and in very close proximity to the well field, have provided an underground path for contaminants in groundwater adjacent to the aquifer boundary (namely, exfiltrated sewage) to be pulled into the aquifer, and to the wells, when the wells are pumping? Yes, we believe so.

On page 2 of the Cleath study, it is stated,

> *"Ground water movement below the narrows is controlled by the City well field. When the wells are in production, a pumping depression develops that draws water radially toward the wells, including sea water drought. During non-pumping periods, ground water flow below the narrows is toward the coast at a nominal hydraulic gradient of 0.005 ft/ft"*

Because of the remediation work between 2000 and 2002, with emphasis on preventing the MTBE from reaching the wells, along with the fact that the City was prohibited from using the wells until remediation was complete, significant amounts of groundwater containing exfiltrated sewage probably would not, in our opinion, have been able to reach the wells until 2002.

Then, in 2002, contaminated groundwater from outside the aquifer boundary would have been pulled directly into the wells as pumping started. In our opinion, the pumping, as it drew in the contaminated water, would create a "plume" of sewage-contaminated water that would be drawn directly to the wells. There would be some mixing with water already in the aquifer, but not enough to dilute the contaminated water to the point that nitrate levels would be in the safe zone.

On pages 16 and 17, the consultants dismiss the possibility that exfiltrated sewage is the cause of the well contamination – for various reasons that we consider totally invalid. We believe that exfiltrated sewage is present in large quantities in the groundwater in the areas around the damaged lines, and that the contaminated water from those areas is pulled into the basin aquifer when the wells are pumping.

If the aquifer boundary was breached during excavation, then clearly, the "pumping depression" that draws water toward the wells could easily pull ground water, contaminated with exfiltrated sewage, through the breach in the boundary, into the aquifer, and subsequently into the wells.

Potential for Contamination from Sewage in the Lines

We would also like to note that, if the basin aquifer is, indeed an unconfined aquifer, then the fact that some of the sewer lines near the well field are under the water table is also significant in terms of potential pollution of the aquifer with sewage.

One of the consultants' assertions that we believe completely erroneous is that there is little potential for sewage to be pulled from the damaged lines by the pressure created when the wells are pumping. For one thing, one of the justifications used to support their assertion is a quote taken completely out of context.

Further, we believe that basic principles of fluid dynamics clearly establish the certainty that, given the size and number of openings in the lines, a considerable amount of sewage can and does exfiltrate from the lines on an ongoing basis. This exfiltration may certainly be increased by the pumping action of the wells, but even when they are not in use, contamination of the ground water with exfiltrated sewage is a continuous, ongoing process.

Summary, and Recommended Next Steps

In summary, we consider the timing of the excavations and the timing of the sudden increase in well contamination to be too much of a "coincidence" to ignore. We see no evidence that the consultants even considered this potential source of well contamination. As previously noted, we consider the possibility of a sudden, radical increase in fertilizer usage to be highly unlikely.

In addition, we do not believe that sufficient evidence was provided to prove that reduced well field production, and thus reduced recharge and reduced dilution of nitrates in the aquifer, is the sole cause, or even a significant partial cause of the spikes in contamination that occur each fall. As previously noted, on page iii, the consultants state,

> *"**Most of the limited ground water production at the well field now occurs during the late fall when the State Water Project shuts down for annual maintenance. Lower production reduces the amount of recharge from stream seepage adjacent to the well field, which had historically diluted nitrate concentrations coming into the area from the lower Morro Valley. Without significant dilution from stream seepage**, and with increasing nitrogen loading from high intensity farming in the lower Morro Valley, nitrate concentrations at the City well field began exceeding the drinking water standard in 2002, and are still increasing.*

We would like to see testing of the ground water adjacent to the aquifer, and of the water in the aquifer, in the immediate region of the wells, with comparison to water IN the wells just before, and during the first few days after pumping begins in November. We believe that such testing would lead to a different conclusion than the one drawn by the consultants.

Conclusions and Recommendations

As previously stated, it is our opinion that the findings presented in the Cleath "Morro Basin Nitrate Study" are based, to a significant extent, upon invalid assumptions, inadequate study of major potential nitrate contamination sources, and in some cases, faulty "science".

Based upon a review of the study by ourselves and by a chemist, upon our independent research, and upon basic logical analysis, we believe that it is not only inappropriate but, in fact, foolish to assert that there is any conclusive proof that the nitrate contamination of our wells can be traced primarily, or even in large part, to farming operations.

We believe strongly that a positive and constructive alliance between the City and local farmers, formed for the purpose of protecting community water supplies, is an excellent idea. We also believe, however, that a coercive, saber-rattling approach, "justified" by what we consider insufficient evidence to blame farmers for water contamination, is NOT the way to go. We consider it appropriate to mention here that It has long been known that it is extremely unwise to bite the hand that feeds you. We hope that Morro Bay City officials will drop the menacing approach, and show respect and consideration for the farmers who grow our food, and help to make our weekly farmer's market events a valuable stimulus for other local businesses, and thus support our local economy.

We would further like to point out some misconceptions regarding use of fertilizers by the farmers. Small farm operators are generally not rich people, and cannot afford waste. We find ludicrous the assumption that our local small farmers can afford to throw excess fertilizer on their fields with wild abandon. One Morro Bay official publicly remarked that farmers had been seen using so much fertilizer that it looked like white clouds above the fields. A bit of research would have revealed that those white clouds were most likely gypsum (calcium sulfate), a commonly used soil additive (not a fertilizer) that can cause the observed effect as it is being applied. This is not an indication that an excessive amount is being used.

We are extremely concerned that data presented in the Cleath Study indicates that nitrate levels in the wells exceeded allowable standards from 2002 on; yet, the residents, and evidently the City Council as well, were not notified of this serious public health issue until 2006. We believe this is a serious breach of public trust.

We further believe that it is extremely interesting that, even after the public was notified of the nitrate contamination in early 2006, there was no apparent effort to identify the source of the contamination until the summer of 2007, when Cleath report data shows that their testing of local water sources began.

We can see no justifiable reason why, if any of our City staff and/or officials knew that nitrate levels in our well water were exceeding standards for public health and safety in 2002, they waited until 2006 to inform the public, and until the summer of 2007 to start looking for the source of the problem. Not the least of what we consider reporting irregularities is the fact that, in 2002, the "well water" was measured at another location, and only after being blended with water from other sources. Is that the same procedure that was followed in 2003 through 2005? If so, why was there no indication on the reports?

Can this questionable nitrate reporting procedure explain why the City reported no violation of nitrate standards in our wells in 2002, 2003, 2004, and 2005, while the Cleath study reports that violations occurred in every one of those years? We recommend an immediate and thorough public investigation of this matter, by independent parties not affiliated with City staff and officials, with findings to be formally shared with residents.

We also believe that the public is entitled to know why the scope of the Cleath study was so limited, in contrast to other well contamination studies we have seen.

- Why was there no investigation of excavations that could potentially have penetrated the aquifer boundary, providing a path for contamination of the aquifer by groundwater in adjacent areas?
- Why were isotopic studies done only on wells and not on water close to the alleged sources?

- Why was the study's treatment of hydrogeology limited to the Morro Basin? Why was the hydrogeology of other areas, from which contaminated water might travel underground to the aquifer, not included?
- Why were farmers not interviewed to determine what fertilizers they were using, and the methods used for application of those fertilizers?

These and other questions need to be answered before City officials make any decisions regarding next steps. Given the numerous and significant questions and issues we have identified, we recommend the following:

1. Do not accept the assertion that agricultural operations are the source of the nitrates in the wells. We believe that this assertion is currently unsupported by any credible evidence.
2. If further studies are to be undertaken, ensure that they include tracer technology and other hydrogeology study methods, as required, to detect the migration paths of contaminants from the sewer lines.
3. Thoroughly investigate events that might have caused the annual spikes in nitrate concentrations to begin in 2002. For example, excavations in the vicinity of the aquifer boundaries might have created a breach that allowed sewage-contaminated ground water to enter, causing the spikes to occur when the wells are pumping.
4. Accelerate repair of the sewer lines, giving it the highest priority. Not only do we believe that exfiltrated sewage is reaching the aquifer. We believe it is reaching the ocean as well.
5. Investigate the discrepancy between well water nitrate readings documented by the consultants, and reported to residents in documents prepared by City staff.
6. If Cleath study reporting of well water nitrate readings is found to be correct, determine why City staff failed to inform the public and City officials of this serious public health issue, and take appropriate action, including the requirement that well water to be tested be gathered from the wells; not from water tanks where the well water has been blended with water from other sources.

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