Condition of the Morro Bay Wastewater Collection System

Video Inspection

Review and Analysis

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

October, 2007

Table of Contents

Introduction 1

Process 2

Findings 3

- **Frequency of Occurrence of Pipe Defects Seen on Tapes we Viewed** 3
- **Deterioration of a Section of the Main Street Trunk Line Over a Seven-Year Period** 4
- **Sunken Sewer Main Dumping Contents Under, Not Into, Main Street Trunk** 4
- **Discrepancies Between Our Logs and Those Done For/By the City** 5
- **Frequency of Occurrence of Pipe Defects Noted in Logs we Reviewed** 5

Conclusions and Recommendations 7

Appendices i

- **Appendix A : Inspection Log Summaries** i
  - **Independent Logs - Set 1** i
  - **Independent Logs - Set 2** iii
  - **Independent Logs - Set 3** vi
  - **MB Logs - Set 1** viii
  - **MB Logs - Set 2** ix
  - **MB Logs - Set 3** xi
  - **MB Logs - Set 4** xiii
- **Appendix B – Comparison of Independent and MB Logs** xvi

Introduction

We have conducted an independent review of a sample of videotapes, and, where available corresponding written logs chronicling the inspections of approximately 1.52 miles of various wastewater collection system lines in Morro Bay. We also reviewed a sample of logs for tapes that we did not view. Those logs cover inspections of approximately 1.89 miles of collection lines.

Our findings, documented in this report, include hundreds of defects, most of which are, or indicate the presence of, openings in the pipes. These openings are identified in various logs as offsets, separations, dislocations, cracks, joint openings, broken joints, chips, structural damage, holes, and root intrusions (an opening must be present for roots to enter a line). The data presents clear and irrefutable evidence that much of, and probably nearly all of, the City's collection system is in a shocking state of disrepair.

As noted in an earlier report, openings in the pipes permit infiltration of water into the system in wet conditions, and exfiltration of raw sewage into the soil when the soil surrounding the lines is dry. The pipe damage documented in this report makes it clear that serious pollution of our soil by untreated sewage is going on all over the City. In addition, Morro Bay is paying for the processing of large amounts of rainwater/runoff that enter the system in wet weather.

The taped inspections and logs we reviewed are from a variety of areas, indicating the very widespread nature of the problem. Given that this review covered only a sample of the total collection system, we believe it is clear that the problem is extremely serious. We have no doubt that additional inspections would uncover more of the same – a completely dilapidated system that is dangerous to our health, and to the environment.

Process

Sample

We chose a sample of videotaped inspections and logs to review. Some of the tapes had corresponding logs done by contractors, and some of the other logs were reviewed on a standalone basis (the corresponding tapes were not viewed). The sample tapes and logs cover inspections of lines in a variety of areas of the City, including downtown, lower Morro Heights, the Beach Tract, several sections of North Morro Bay, east of the highway, a section of Atascadero Road, and major portions of the Main Street Trunk Line.

Tapes:

The City made 30 tapes and 3 DVD's available to us, along with all of the logs available for the taped records. We chose 6 of the tapes for our sample. In total, we reviewed and logged defects in approximately 8,065 feet, or approximately 1.52 miles, of line.

Logs

The additional logs we reviewed (for which we did no corresponding reviews of videotaped records) cover a total of 9,991 feet, or 1.89 miles.

Methodology

- We viewed all of the sample tapes. and logged, in detail, all visible damage to the pipes, and the presence of debris, grease (generally this is from restaurants) and roots. The tapes were viewed by three Morro Bay citizens. One, who is a certified CWEA Grade IV Wastewater Collection System Operator, was responsible for identifying the defects; the other two were responsible for logging them.
- We logged all defects, even when we considered them minor. We did this because the impact of multiple minor defects will be the same as the impact of one larger one, and because, due to the fact that soil movement tends to continue, small defects can generally be expected to grow into larger ones. Copies of our logs were provided to Senior Civil Engineer Dylan Wade, of the City's Public Works Department.
- For all logs that were created during this review, we summarized the system damage according to type. We documented the summaries in "log sets" that correspond to videotapes. Figures from the log set summaries from our logs were rolled up into overall totals.
- A small portion of one tape we viewed, created in the year 2007, duplicated material on another, dated 2000. We adjusted our defect totals to avoid "double counting" of defects, and compiled data showing the increase in defects over the 7-year period. We also noted one particularly severe and dangerous defect seen in the 2007 tape that existed in 2000, but was never repaired.
- For portions of two tapes that we viewed and created logs for, a set of logs already had been done by the inspection companies. We compared their logs to ours, and identified the differences. Because of discrepancies between our logs, and the inspection companies', we compiled and documented comparisons of the corresponding logs.
- We also reviewed inspection logs provided for additional tapes/DVD's that we did not view. Although prior analysis told us that these logs might not include records of all actual defects in the lines inspected, we transcribed and summarized the data, and included it in this report to give a general idea of the condition of lines in the areas covered.

Findings

The tapes and logs that we reviewed provide irrefutable evidence that the Morro Bay wastewater collection system is in a serious state of disrepair. There are hundreds of defects, many of them major, in the collection lines included in the inspection tapes and logs we reviewed. Because our sample came from a variety of areas of the City, because most of the system is old, and because of many years of deferred maintenance, we believe it is reasonable to assume that most of the system is in similar condition.

Frequency of Occurrence of Pipe Defects Seen on Tapes we Viewed

Table 1, below, provides a summary of findings from the tapes we viewed. Please see Appendix A, Inspection Log Summaries, for the source data for this table.

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

These figures are intended to give a picture of the various types of defect present in the lines we reviewed. In some cases, multiple defects are present at one pipe joint, or in one area of a pipe. For example, we might have an offset and separation at one joint, or a crack and root intrusion in one section of a pipe. Therefore, the total number of defects is not representative of the total number of points in the lines where there are defects. For example, at 49 joints, we found both offset and separation. Still, these numbers are high enough to be very alarming. Any offset, separation, dislocation, crack, or break can, depending on its location and other conditions, present the risk of raw sewage leaking into the soil.

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**. Every 11.4 feet, on average, we have the potential for, depending upon conditions, inflow and infiltration (I&I) and/or exfiltration – the leakage of raw sewage into the soil.**

Were we to continue the calculations, figuring in dislocated joints, cracked areas, major breaks, and bad lateral connections, the average distance between pipe defects would be shorter than just this distance between defective pipe joints, as not all defects occur at a joint..

Deterioration of a Section of the Main Street Trunk Line Over a Seven-Year Period

For one section of the Morro Bay Trunk Line, running from manhole 73 to 3, a distance of about 770 feet, we viewed an inspection tape made in 2000, and another made in 2007 Thus, we were able to observe deterioration of the line over a seven year period. Manhole 73 is located at Main and Island streets, followed, to the south, by manholes 1, 2, and 3. Table 2, below, compares the defects found in the tape made in 2000 with those found in the tape made in 2007.

Table 2: Increase in Defects in Main Street Trunk Line 2000 - 2007

Type of defect	**2000**	**2007**
Offset joints	39 (1 a sunken main)	68 (one a sunken main)
Separations	5	11
Cracks	2	10, most severe
Bellies	1	4
Connections with grease	1	
Extended areas of grease (in portion of line under Alva Paul Creek)	1	1
Areas of debris		1
Manholes with missing pan		1

One can clearly see that the number of defects increased significantly over 7 years – a fact that is not surprising, due to the fact that continued sinking of the soil, probably due in large part to the sunken main connection, would have directly caused more offsets, separations, and cracks.

Sunken Sewer Main Dumping Contents Under, Not Into, Main Street Trunk

The sunken main connection noted above is particularly troubling. In both the 2000 and the 2007 tapes of the section of the Trunk Line between manholes 1 and 2, the sunken connection, which is about fifty feet north of manhole 2, was very visible. It was also logged by the contractor who created the Morro Bay log of the 2000 tape. He listed it as, “lateral broken, dirt evident/defective connection”. In both tapes, the main was obviously dumping its contents UNDER, rather than into the Main Street trunk. This main serves an area of North Morro Bay between Alva Paul Creek and Sequoia. We have submitted a request to the City attorney for information that will allow us to estimate the total amount of sewage this represents. When that information is received, and our investigation is complete, we will issue a supplemental report. However, we can initially predict that the area with lines that feed into this main will include dozens of homes.

Discrepancies Between Our Logs and Those Done For/By the City

In two cases, logs we created corresponded to logs of sections of the same tapes that had previously been logged for the City, either by contractors, or by City employees. We found that our logs included significantly more defects than those done for/by the City. We are unsure as to why this would be the case, but possibly, the person doing the City logs had limited experience in spotting certain types of defects. A comparison of one of our logs, to the City's corresponding log, may be viewed in Appendix B.

Frequency of Occurrence of Pipe Defects Noted in Logs we Reviewed

In order to provide information about the condition of lines in areas of the City for which we did not review tapes, we have included here a summary of the defects noted in logs done by contractors.

- Table 3 cover lines in North Morro Bay, on the east side of Highway 1, and in the Beach Tract.
- Table 4 covers lines in the Beach Tract
- Table 5 covers lines in downtown Morro Bay, lower Morro Heights, and a section of Ironwood Ave,.

These three tables cover a total of 9,991 feet, or 1.89 miles. **The average, for all three tables, is one defect that may potentially allow I&I and/or exfiltration every 17.97 feet**.

Totals for these logs were NOT counted in figures that appear in Table 1, as that table covers only our own, independently done logs.

Table 3: Contractor Logs, North Morro Bay and Beach Tract

Type of Defect/Problem	Total # of Occurrences
Offset Joints	65
Broken Joints	2
Cracked areas	27
Holes	2
Root Intrusion in joints	Nearly every joint for 180 feet – about 36 joints
Chipped areas	3
Bellies/Dips (sagging pipes)	10
Areas of debris	11
Areas of grease buildup	1

The 22 inspections included in Table 3 cover 4,498 feet of pipe, about .85 mile, and are from Morro Bay Log Set 1, in Appendix A.. If we total offset joints and broken joints, we have a total of 67 defective joints. Because root intrusion implies a damaged joint, we may also add the approximately 36 joints thus affected, giving a total of 103 defective joints. **This implies, on average, one bad joint, which may permit I&I and/or exfiltration for every 43.7 feet of line.** As previously stated, some defects might or might not occur at joints. If the cracks, chips, and holes cited here do not, then we have a total of 135 defects and an average of **one pipe defect that may permit I&I and/or exfiltration every 33.3 feet.**

Table 4: Contractor Logs, Beach Tract	
Type of Defect/Problem	**Total # of Occurrences**
Offset joints	19
Joint openings	2
Cracked areas	19
Root Intrusion in joints/laterals	41
Bellies/Dips (sagging pipes)	1

The 8 inspections included in table 4 cover 1,352 feet of pipe, about **.**26 mile, and are the first 8 items from Morro Bay Log Set 1. If we total offset joints and open joints, we have a total of 21 defective joints. Because this contractor did not specify the type of opening that permitted root intrusion, we will assume that the opening is an offset, a separation, or both. Adding in the 41 joints with root intrusion, we now have a total of 62 bad joints, 2 being joints of the main with laterals. Dividing 1,352 by 62, **we have, on average, a bad joint, which may permit I&I and/or exfiltration, every 21.8 feet**. As previously stated, some defects might or might not occur at joints. If the cracks cited here do not, then adding in the 19 cracked areas, we have a total of 81 total defects. Dividing 1,352 by 81, **on average, we have a pipe defect that may permit I&I and/or exfiltration every 16.7 feet.**

Table 5: Contractor Logs, Downtown Morro Bay, Lower Morro Heights, Section of Ironwood	
Type of Defect/Problem	**Total # of Occurrences**
Offset joints	18
Cracked areas	7
Root Intrusion in joints/laterals	315
Bellies/Dips (sagging pipes)	3
Areas with grease	4
Areas with debris	2

The 20 inspections included in table 5 cover a total of 4,245 feet of pipe. One page of one log, covering 104 feet, was missing from the materials we received, and so we saw logs for, and will address problems found in the remaining 4,141 feet. – approximately **.**78 mile. Again, the contractor did not identify the type of joint opening that allowed root intrusion, and again, we will assume that the opening is an offset or separation. Here, we have a total of 333 defective joints. Dividing 4,141 by 333, **we have, on average, a defective joint that may permit I&I and/or exfiltration every 12.44 feet**. As previously stated, some defects might or might not occur at joints. If the cracks cited here do not, adding in the 7 cracked areas, we have a total of 340 defects, and **on average, a defect that may permit I&I and/or exfiltration, every 12.18 feet**.

Conclusions and Recommendations

The Morro Bay wastewater collection system is in very poor condition,. Ongoing impacts of this problem include:

- **Exfiltration of raw sewage into the soil**
  - → **Pollution of groundwater**
  - → **Pollution of the Bay, and the Ocean**
  - → **Flood control and drainage issues**
- **Infiltration and inflow of water into the system during wet conditions**
  - → **Surcharging**
  - → **Reduced system capacity**
  - → **Higher processing costs**

There are so many defects that allow exfiltration that it could be said that much of Morro Bay is functioning as an enormous leach field for sewage. Leach fields, when constructed with proper filtering materials, in sufficient amounts for the volume of sewage to be treated, are not a bad thing. However, the soil under our streets and properties is not intended to function as a leach field, and the pollutants in the sewage are most certainly reaching our groundwater, our creeks, the Bay, and the ocean. Every home or other structure that includes toilet facilities is potentially contributing to this pollution, which presents a serious risk to health, safety, and the environment.

The Morro Bay East Estuary State Marine Reserve was implemented on September 21, 2007. The Marine Protection Act, by which the State marine Reserve is mandated, forbids the “take”; disturbance or alteration of living marine organisms within.

Morro Bay and the Morro Bay Power Plant, along with Los Osos, SLO County, the Morro Bay Harbor Department, Fish and Game, and State Parks are going to be held accountable for any violations of the Marine Protection Act. Concerned citizens and those responsible for the administration of these entities need a collaborative effort to solve the water pollution problem with respect to the State Marine Reserve. The City needs a biodiversity action plan (BAP).

It must also be noted that Assembly Bill 1066 requires local governments to consider the impacts of sea level rise when preparing and amending a local coastal program. The current changes in our coastal policies must be taken seriously and incorporated into any project that the City undertakes. Obviously, this includes the upgrade, repair, and replacement of wastewater collection infrastructure, and is particularly significant in terms of the location of the Wastewater Treatment Plant.

We are aware of recent discussions in which primary reasons for the decision not to build a fire station at the intersection of San Jacinto and Highway 1 were that site’s location in 100-year and 500-year flood plains, and the risk of tsunami inundation. Yet, the location of the current Wastewater Treatment Plant, and for the new facility, is almost exactly the same distance from the ocean, and only a short distance south of the rejected fire station site. The existing location of the Plant would require a containment wall to be built to keep sea water out, and sewage in. this is obviously neither a viable long-term or short-term solution.

The severity and urgency of Morro Bay’s pollution problem, and of the need for intelligent, well-planned infrastructure repair and replacement, cannot be over-emphasized.

We recommend that the following actions be taken immediately:

1. **Institute an immediate ban on all new construction**: This includes all parties that use and contribute sewage to the Morro Bay collection and conveyance system: the City of Morro Bay, the Cayucos Sanitary District, the County-run golf course, and California State Parks facilities. This ban should remain in effect until the corresponding collection and conveyance system infrastructure is repaired and/or replaced.
2. **Determine repair/replacement priorities and costs**: Hire a consultant (team) to identify the areas of concern that pose the most serious public health and safety risk. Their work would include conducting new video inspections of collection system lines, identification and prioritization of areas of highest concern, and development of estimates for repair costs.
3. **Investigate a regional solution for wastewater treatment.** With the County taking the lead, Morro Bay, Cayucos, the Morro Bay golf course, State Parks, and Los Osos can address water supply and wastewater treatment issues with a regional plan – a plan that would protect the new Morro Bay East Estuary State Marine Reserve with a sustainable, expandable, and affordable wastewater treatment solution. A holistic solution will maximize health and safety, and minimize cost

   This type of wetlands restoration project is currently being undertaken for the town of Petaluma by Corrollo Enginerring. Because Morro Bay is already working with that engineering firm, information would be readily available to our City government.
4. **Investigate alternative locations for the Wastewater Treatment Plant**. As part of the process of repairing and replacing the infrastructure, address the serious risks inherent in the current location of the Morro Bay Wastewater Treatment Plant. Open discussions with the County of San Luis Obispo, and with all users of the treatment facility, regarding moving the Plant away from the beach.
5. **Hire a consultant to assist in finding new sources of funding**. Additional funding is needed so that correction of problems in the collection system can be accelerated. The current 3-year timeframe is, in our opinion, too long, and will allow for far too much pollution to occur before necessary repairs are complete. Potential sources of funding include:

   a. Prop. 84, Funds projects relating to emergency safe drinking water, water quality flood control, and beaches. Prop 84 makes available $5.4 billon, raised through bonds.

   b. Prop 50.: Administered b the State Water Boards, Proposition 50 funds projects that address water quality and the supply of safe drinking water. It also provides coastal wetlands purchases, something that would be needed for a regional plan for wastewater treatment. Prop 50 makes available $3.5 billion, raised through bonds, and repaid from State General Fund).

   c. Possible Joint Project with Chevron and/or PG&E:: These firms may be interested in the fact that a wetlands restoration project provides the most efficient CO_2 sequestering. By helping to fund a wetlands project, they will be eligible for global greenhouse gas credits.
6. **Develop a biodiversity Action Plan (BAP)**. In the current political and environmental climate, there is a need for a sustainable, expandable, and affordable solution for water supply and treatment. This could be addressed by the Blue Carpet water treatment plan. Basically, this plan would utilize the internationally recognized BAP program for the Morro Bay Estuary and its State Marine Reserve, integrating:
   - A sustainable wetlands restoration project
   - Support and Protection of bird and other endangered species habitat
   - Resolution and management of water supply and water treatment issues

   for all of the communities of Estero Bay. Let's roll out the blue carpet for our future generations.

Appendices

Appendix A : Inspection Log Summaries

Please note that these Summaries are supported by compete, detailed logs detailing the locations of the defects identified. Copies of those logs are available upon request.

Independent Logs - Set 1

The following 20 inspection logs are contained in a single document, dated September, 2007, written by the authors of this report

Note that these logs correspond to logs done for the City by a consulting firm, included in this document as MB Logs, Set 1.

Areas of Morro Bay Included:

This set of logs includes inspections of a section of the Main Street Trunk line, lines in North Morro Bay, east of Hwy 1, and a section of line along Kern Avenue.

Summary of Findings for This Set of Logs

These 8 inspections cover about 1,675 feet of pipe, about **.**32 mile

Problems identified in this set of logs include:

- **Roots in joints of approximately 330 feet of pipe**
- **168 offsets**
- **73 separated joints**
- **24 areas with cracking**
- **9 dislocated joints**
- **3 areas with debris**
- **1 major break**
- **1 large area of grease buildup**
- **4 bad lateral connections**
- **1 area where 2 lateral connections are too close together (weakens pipe)**
- **5 bellies**
- **2 manholes with pan missing (pan reduces I&I)**

We noted that the logs done for the City, MB Logs, Set 1, contained significantly fewer notations of damage than did these.

Summaries by Log

1. Main south of Island, Corresponds to MB Logs, Set 1, item 9.
   2 offset joints
   1 crack
   1 major break and dislocation with radial cracking
   1 area of heavy grease, extends about 15 feet
   2 areas of debris, one of which stopped the camera
2. Main at Jamaica, going south, manholes 69 → 73 Corresponds to MB Logs, Set 1, item 10

Roots at most joints from 23 feet to 163 feet
9 offset joints
2 cracks
1 offset joint with separation and radial crack
5 joint dislocations, 1 major
6 joint separations
1 belly

3. Alva Paul Creek to Sequoia, manhole 1 → 3, Corresponds to MB Logs, Set 1, item 11
61 offset joints, some severe (1 a sunken main)
6 separated joints
5 joints with separation and offset
9 Cracks, most are severe
4 bellies
1 manhole with pan missing

4. Easement between Preston Lane and Little Morro Creek Corresponds to MB Logs, Set 1, item 12
Roots in several joints
18 offset joints
2 joints with offset and separation
1 separation
2 poorly connected lateral lines
1 area with multiple cracks, piece of line appears ready to come loose

5. Koa, Conejo to San Juan, manhole 32 → 33 Corresponds to MB Logs, Set 1, item 13
10 offsets, 2 major, 4 minor
1 minor separation
2 joints with offset and separation

6. Laurel south from Avalon, manhole 76 – 76B Corresponds to MB Logs, Set 1, item 14
Roots in joints in about half of the pipe; two large root balls
11 offsets, 3 major, 2 minor
3 separations
1 area of cracking
1 dislocation
2 lateral connections too close together (weakens pipe), 1 dislocated, 1 plugged
1 large piece concrete debris

7. Kern, manhole 9 →7 Corresponds to MB Logs, Set 1, item 15
Roots in most joints
23 offsets, 3 major, 1 minor
2 separations
5 areas with cracking, several severe, multiple cracks, 2 with piece of pipe loose
2 bad lateral connections
2 dislocated joint

8. Kern, manhole 7 → 9, going south Corresponds to MB Logs, Set 1, item 16
Roots at most joints, from 58 feet on, severe in several areas; 1 area where 80% of pipe is filled
24 offsets, 6 minor
33 separations, 2 major
1 joints with offset and separation
3 areas with cracking, one with piece of pipe loose, looks as if it could come out
2 bad lateral connections
1 manhole with missing pan

Independent Logs - Set 2

The following 28 inspection logs are contained in a single document, dated September, 2007, written by the authors of this report

Note that these logs correspond to logs done for the City by a consulting firm, included in this document as MB Logs, Set 2.

Areas of Morro Bay Included:

.This set of logs includes inspections of the Main Street trunk line from manhole 20 to manhole 56

Summary of Findings for This Set of Logs

These 28 inspections cover about 5501 feet of pipe, about 1.04 mile

Problems identified in this set of logs include:

- **Roots in joints of approximately 38 feet of pipe**
- **396 offsets**
- **88 separated joints**
- **15 areas with cracking**
- **7 dislocated joints**
- **1 major break**
- **8 sewer main connections with grease buildup**
- **1 large area with grease buildup**
- **1 bad lateral connections (sunken sewer main)**
- **36 bellies**
- **6 areas of H_2S gas**

We noted that the logs done for the City, MB Logs, Set 2, contained significantly fewer notations of damage than did these.

Summaries by Log

1: Main, starting at Zanzibar, manhole 20 → 21 136 foot pipe
- 6 offsets, 2 of them at sewer main connections
- Roots at one of the offset joints
- 1 major belly

2: Main, starting at Yerba Buena, manhole 21 → 25 45 foot pipe
- 2 offsets, one minor
- 1 probable major belly (camera underwater for some distance)

3: Main, manhole 25 → 26, foot counter not reset 158 foot pipe
- 8 offsets, I major, 6 minor
- 10 separations
- 1 crack
- 2 areas with roots
- 1 belly
- 1 area of H_2S gas

4. Main, manhole 26 → 27, counter was reset 143 foot pipe
- 8 offsets, 6 minor
- 7 separations, 6 minor

2 areas with roots

5 Main, manhole 27 → 31, counter was reset 165 foot pipe
5 offsets, 4 minor
1 separation
1 belly

6. Main, manhole 31 → 34, counter was reset 165 foot pipe
4 minor offsets, one in sewer main connection

7: Main, manhole 34 → 37, counter was not reset 167 foot pipe
8 minor offsets

8. Main, manhole 37 → 40, counter was not reset 168 foot pipe
12 offsets, 7 minor
1 minor separation

9: Main, manhole 40 → 43, counter was not reset 170 foot pipe
17 offsets
1 break/crack
1 area H_2S gas
5 areas of exfiltration

10. Main, manhole 43 → 46, counter was reset 163 foot pipe
4 offsets
1 joint with offset and separation

11: Main, manhole 46 → 49, counter was not reset 167 foot pipe
10 offsets, 1 minor
2 cracks
5 areas of exfiltration
2 bellies

12: Main, manhole 49 →54, counter was not reset 165 foot pipe
6 offsets, 1 minor
1 belly
1 crack

13: Main, manhole 54 → 57, counter was not reset 168 foot pipe
7 offsets
6 separations
3 dislocations
3 areas with roots, 1 major
1 belly

14: Main, manhole 57 → 60 167 feet
9 offsets, 1 major
1 large crack
2 areas of exfiltration
2 bellies

15. Main, manhole 60 → 63, counter was not reset 165 foot pipe
15 offsets
1 crack
7 areas of exfiltration
2 bellies

16. Main, manhole 63 → 66, counter was not reset 170 foot pipe
11 offsets
1 separation
1 cracked sewer main connection
2 bellies
5 areas of exfiltration

17. Main, manhole 66 → 69, counter was reset 165 foot pipe
15 offsets, 1 major
1 joint with offset and separation
5 areas of exfiltration

1 belly

18: Main, manhole 69 → 72, counter was not reset 168 foot pipe

11 offsets
16 separations
17 areas with roots
2 bellies

19 Main, manhole 72 → 73

Tape of this segment of the line is damaged. Cannot see anything

20 Main, manhole 73 → 1 couunter not reset cannot estimate length due to problems with last segment problems noted here cover about 20 feet total

2 offsets
1 area pipe damage (crack?)
1 long stretch of heavy grease (corresponds with what contractor said was rust)

21 Main, manhole 2 → 3 couunter reset – reported damage on 230 feet of pipe, then counter went out.

14 offsets
1 separation
4 joints with offset and separation, 1 minor; 1 of the offsets major
1 connection with minor grease
After 230 feet – camera gets stuck, then counter stops. After the camera is freed, it continues, but the operator failed to start up the counter again, so we cannot report location of additional damage. We did see more offset joints, a belly, and major exfiltration and infiltration from Alva Paul creek, as well as grease

22 Main, manhole 1 → 2 counter reset 372 foot pipe

18 offsets, 4 minor
1 joint with separation and offset
1 crack
2 areas exfiltration
1 sewer main that has sunk so far it is dumping its entire contents UNDER the trunk line
3 bellies
1 area H_2S gas

23 Main, manhole 3 → 9 counter reset 342 foot pipe

35 offsets, 6 minor, 3 major
4 joints with offset and separation
3 cracks, 2 major, 1 cracked area with piece of pipe loose
5 bellies

24 Main, manhole 9 → 10 counter reset 343 foot pipe

31 offsets, 8 minor, 2 major
3 joints with offset and separation, 1 minor
3 joints with offset and dislocation
1 sewer main connection with I&I
1 small longitudinal crack
2 sewer main connections with infiltration
1 sewer main connection with grease
4 areas of H_2S gas
1 belly

25 Main, manhole 10 → 11 counter reset 342 foot pipe

32 offsets, 5 minor
2 sewer main connections with infiltration
3 areas of exfiltration
3 bellies
1 area H_2S gas

26 Main, manhole 12 → 11 counter reset going upstream, against flow 346 foot pipe

28 offsets, 1 major, 1 minpr
21 joints with offset and separation
2 sewer main connections with grease, 1 major
1 area of roots

2 bellies
283 feet – camera then goes underwater, counter is not working. Cannot record further damage due to counter malfunction

27 Main, manhole 12 → 55 counter reset 345 foot pipe
29 offsets, 2 minor
4 joints with offset and separation
1 crack
2 sewer main connections with grease
9 areas with roots, 1 major

28 Main, manhole 55 → 56 counter reset 344 foot pipe
24 offsets, 2 minor, major
2 joints with offset and separation
5 separations
1 longitudinal crack at 12 o' clock, major infiltration
5 areas of roots
2 sewer main connections with grease, 1 major
multiple bellies – camera goes under water over and over.

Independent Logs - Set 3

The following 20 inspection logs are contained in a single document, dated September, 2007, written by the authors of this report.

These logs do NOT correspond to any Morro Bay logs included in this document. To our knowledge, no logs of this tape were done by Morro Bay

Areas of Morro Bay Included:

Main Street trunk line from Hwy 41 to WWTP, metering manhole, Atascadero Road

Summary of Findings for This Set of Logs

These 5 inspections cover a total of 889 feet of pipe, about **.**17 mile.

Problems identified in this set of logs include:

- **Roots in 1 area**
- **25 offset joints**
- **2 separated joints**
- **10 cracked areas**
- **2 areas of significant structural damage** (type unspecified)
- **35 areas of I&I,.many severe. Pipe appears to be below water table**
- **5 areas of debris**
- **3 areas of grease buildup**
- **7 bellies**
- **1 area where H_2S gas is visible**

Summaries by Log

1. Main Street Trunk line between corp yard and 30" trunk, 17 foot pipe
1 Severe offset with severe I&I; camera could go no farther

2. Main Street Trunk, starting at Highyway 41 and Main, going south – 327 foot pipe
    1 area of debris and severe grease buildup; grease continues 78 feet.
    1 root ball
    2 offsets - 1 minor
    4 areas of I&I at joints
    1 belly
    1 evidence of surcharge about 10 feet up into manhole
    1 area where H_2S gas is visible
3. Metering manhole – appears in good condition, no problems noted
4. Main Street Trunk line, manhole 2 → 4, 140 foot pipe
    1 offset joint. Line appears flat here
5. Atascadero Road, 405 foot pipe
    22 offset joints
    2 separated joints
    29 areas of I&I, many severe, with very large amounts of water entering the pipe
    10 cracked areas
    2 area of significant structural damage, 1 possibly from earthquake
    6 bellies
    5 areas of debris
    3 areas of grease buildup

MB Logs - Set 1

The following 20 inspection logs are contained in a single document, dated January 18, 2007, done by Video Inspection Specialists, Inc.

Note: We did an independent review of the same videotape, and compiled our own logs. Those are contained in this document, under the heading, Independent Logs – Set 1.

Areas of Morro Bay Included:

This set of logs includes inspections of pipes in North Morro Bay, east of Hwy 1, and the Beach Tract.

Summary of Findings for This Set of Logs

These 16 inspections cover a total of 2,962 feet of pipe, about **.**56 mile.

Problems identified in this set of logs include:

- **Roots in most joints for a total of about 600 feet.- about 123 joints**
- **39 offset joints**
- **38 cracks**
- **1 area described as "crushed"**
- **2 joint openings (separations)**
- **3 dips**
- **1 hole**
- **1 possibly tuberculated area**

We noted that our logs (Independent Logs – Set 2) included significantly more notations of damage.

Summaries by Log

1. Blanka between Panorama and Tuscan, 275 foot pipe, manhole 10 → 10A
   Roots at 4 joints,
   3 offset joints, one severe
2. Orcas between Tide and Panorama, 152 foot pipe, manhole 44 → 44A
   Roots in one area
   8 offset joints, one severe, one major
3. Beachcomber between Luzon and Kodiak, 128 foot pipe, manhole 24 → 23
   3 offset joints
   1 dip
   Area where pipe bends upward; then downward, over run of about 16 feet
4. Beachcomber between Luzon and Kodiak, 122 foot pipe, East structure → manhole 24
   1 offset joint
5. Sandalwood between Sienna and Terra, 64 foot pipe, manhole 60 → 59
   Roots at 20 joints, 2 laterals
   6 cracks
6. Coral between Sienna and Terra, 336 foot pipe, manhole 59 → 60
   Roots in 6 joints, 1 lateral
   3 offset joints
   7 cracks; in of the 7 areas, notes say "longitudinal crack in pipe – multiple"
   1 joint opening
7. Coral between Sienna and Terra, 76 foot pipe, manhole 59 → East structure

Roots at 9 joints, 2 laterals
1 offset joint
1 crack

8. Sandalwood between Verdon and Azure, 199 foot pipe, manhole 67 → 70

Roots In 1 area
7 Cracks, 5 described as "longitudinal, continued down line"
1 joint opening
Possible repair area, half concrete, half wood

9. Main, just south of Island, 98 foot pipe, manhole 73 → 1 Corresponds to Independent Logs, Set 1, item 1.

1 offset joint
1 possibly tuberculated area
1 hole
1 break, with offset major enough to stop camera from passing

10. Main, from Jamaica, heading south, 225 foot pipe, manhole 69 → 73 Corresponds to Independent Logs, Set 1, item 2.

Roots at most joints 9 feet to 174 feet
2 cracks

11. Main between Alva Paul Creek and Sequoia, 725 foot pipe, manhole 1 → manhole 3 Corresponds to Independent Logs, Set 1, item 3.

2 offset joints, 1 major
9 cracks
2 dips

12. Easement between Preston and Little Morro Creek Road, 80 foot pipe, manhole 30 → 30A Corresponds to Independent Logs, Set 1, item 4.

Roots at 3 joints
8 offset joints
1 crack

13. South on Koa from Conejo to San Juan, 88 foot pipe, manhole 32 → 33 Corresponds to Independent Logs, Set 1, item 5

Roots at one joint

14, South on Laurel from Avalon, 60 foot pipe, manhole 76 → 76B Corresponds to Independent Logs, Set 1, item 6.

Roots at 5 joints
3 offset joints

15. North on Kern Avenue, 127 foot pipe, manhole 9 → 7 Corresponds to Independent Logs, Set 1, item 7.

Roots at almost every joint
6 offset joints
4 cracks
1 area with multiple cracks, described as "crushed"

16. South on Kern, 272 foot pipe, manhole 7 → 9 Corresponds to Independent Logs, Set 1, item 8.

Roots at almost every joint from 58 feet, on
1 crack
1 dip

MB Logs - Set 2

The following 20 inspection logs are contained in a single document, dated April 19, 2000, done by Simon Sewer Maintenance

Note: We did an independent review of the same videotape, and compiled our own logs. Those are contained in this document, under the heading, Independent Logs – Set 2

.

Areas of Morro Bay Included:

This set of logs includes inspections of sections of the Main Street Trunk line in North Morro Bay

Summary of Findings for This Set of Logs

These 28 inspections cover a total of 5501 feet of pipe, about 1.04 mile.

Problems identified in this set of logs include:

- **Roots in 5 joints**
- **10 offset joints**
- **8 cracks**
- **7 pipe sags/bellies**
- **1 "heavily rusted" area across creek (independent review identified this as grease, not rust)**

We noted that our logs (Independent Logs – Set 2) included significantly more notations of damage

Summaries by Log

1. Main, manhole 20 → 21
   1 offset at service connection
2. Main, manhole 21 → 25, counter reset
   Note that pipe is Unpassable at 45.7 feet
3. Main, manhole 25 → 26, counter not reset
   1 offset joint
   1 area of roots
   Notation that manhole 25, discovered in a field, needs to be raised.
4. Main, manhole 26 → 27, counter reset
   Manhole 26 no insert
5. Main, manhole 27 → 31
   No defects noted
6. Main, manhole 31 → 34 counter reset
   No defects noted
7. Main, manhole 34 → 37, counter not reset
   No defects noted
8. Main, manhole 37 → 40, counter not reset
   1 joint with possible, slight infiltration
9. Main, manhole 40 → 43, counter not reset
   2 crack/broken pipe
10. Main, manhole 43 → 46, counter reset
    No defects noted
11. Main, manhole 46 → 49, counter not reset
    2 cracks

12. Main, manhole 49 →54, counter was not reset
    No defects noted
13. Main, manhole 54 → 57, counter not reset
3 areas with roots, 1 in connection
14. Main, manhole 57 → 60, counter reset
    1 pipe sag
15. Main, manhole 60 → 63, counter not reset
    1 crack

16. Main, manhole 63 → 66, counter was not reset
    1 sewer connection with minor drips
17. Main, manhole 66 → 69, counter reset
    No defects noted
18. Main, manhole 69 → 72, counter not reset
    3 joints with minor roots
19. Main, manhole 72 → 73, counter not reset
    No defects noted
20. Main, manhole 73 → 1 couunter not reset
    cast iron pipe across creek, heavily rusted above flow line, unpassable
21 Main, manhole 2 → 3 couunter reset
    1 crack
22. Main, labeled manhole 2 → 3, actually 1 to 2 counter reset
    1 offset
    1 lateral broken, dirt evident/defective connection
23. Main, manhole 3 → 9 counter reset
    1 offset joint
24 Main, manhole 9 → 10 counter reset
    1 service connection with possible I&I, medium
25. Main, manhole 10 → 11 counter reset
    1 area, 10 feet long, camera underwater
26. Main, manhole 12 → 11 counter reset upstream
    2 offset joints, 1 with possible I&I
    1 service connection with possible I&I
    2 areas camera underwater
27. Main, manhole 12 → 55 counter reset
    1 area with roots
28. Main, manhole 55 → 56 counter reset
    2 offset joints
    2 cracks
    3 bellies

MB Logs - Set 3

The following 20 inspection logs are contained in a single document, dated June 18, 19, 2007, done by Video Inspection Specialists, Inc.

We did not review the tape covered by this set of logs, so there are no corresponding independent log sets.

Areas of Morro Bay Included:

This set of logs includes inspections of pipes in North Morro Bay, east side of Hwy 1, and Beach Tract.
.

Summary of Findings for This Set of Logs

These 22 inspections cover 4,498 feet of pipe, about **.**85 mile.

Problems identified in this set of logs include:

- **Roots in almost every joint for a total of about 180 feet – approx. 36 joints**
- **65 offset joints**
- **2 broken joints**

- **27 cracks**
- **3 chipped areas, one of them a joint**
- **11 areas of debris, two of which are sand**
- **2 holes**
- **10 dips**
- **1 area of grease**

Summaries by Log

1. Cuesta Avenue from Maple and Laurel, 282 foot pipe, mnhole 3 → 4
    1 dip
2. Easement at end of Laurel, 63 foot pipe, manhole 11 → 12
    Roots at almost every joint
    1 crack
    1 offset joint
    1 area of grease
3. Easement at end of Koa, 3 foot pipe, manhole 13 → 13A
    Pipe deflected, camera will not fit into line – inspection not completed
4. Easement at end of Koa, 5 foot pipe, manhole 13 → 12
    Root blockage so severe that camera cannot enter, inspection not completed.
5. Ironwood, from Paula, 306 foot pipe, manhole 57 → 57C
    26 offset joints
    1 area of mortar debris
6. Avalon from Laurel to Ironwood, 338 foot pipe, manhole 76 → 77
    Roots in a few joints
    4 radial cracks
    1 offset joint
    1 broken joint
7. Greenwood from Elena, 39 foot pipe, manhole 54 → 53
    2 offsets, 1 so major that camera could not get past it (at 53 feet)
8. Greenwood from Elena, 291 foot pipe, manhole 54 → 55
    Roots in a couple of areas
    1 offset joint
    4 cracks
    1 area of debris
    1 hole in top of pipe
    1 chipped area
9. Greenwood between Elena and Paula, 291 foot pipe, manhole 55 → 56
    6 offset joints
    1 crack
    1 dip
10. Greenwood to Paula, 293 foot pipe, manhole 56 → 61
    Roots in one area
    1 offset joint
    3 cracks
    1 hole in bottom of “tap”
    3 dips
11. Greenwood from Paula, 331 foot pipe, manhole 61 → 62
    3 offset joints
    2 chipped joints
    2 cracks
    3 areas of debris
    2 dip
12. Greenwood between Paula and Bonita, 327 foot pipe, manhole 62 → 63

3 offset joints, one major
1 broken joint
4 cracks
Hole at bottom portion of “tap”

13. Greenwood to Avalon, 325 foot pipe, manhole 63 → 82
    1 area of roots
    5 offset joints
    2 cracks
    2 dips
    1 area of possible debris
14. Ironwood, north of Elena, to Greenwood, 427 foot pipe, manyhole 51 → 53
    Roots at 4 joints
    1 offset joint
    2 cracks
15. San Joaquin from Elm to Cedar, 279 foot pipe, manhole 50 → 52
    6 offset joints
    1 dip
16. San Jacinto from Cedar to Alder, 279 foot pipe, manhole 45 → 47
    3 cracks
    1 dip
17. Sicily to Tide, 90 foot pipe, manhole 35 → 36
    Roots in 5 areas, 1 severe
    1 offset joint
    1 crack
    1 area of debris – stopped inspection at 90 feet.
18. Yerba Buena from Tide, 38 foot pipe, manhole 24 → 25
    4 offset joints, 2 severe, and one so bad it stopped the inspection – camera can’t get past
19. Yerba Buena just east of Maon, 229 foot pipe, manhole 25 → 24
    3 offset joints
    1 crack
20. Island from Sandalwood, 50 foot pipe, manhole 33 → 32
    Roots at 1 joint
    Metal “rodder” in line, stopped inspection as camera could not get past
21. Coral between Island and Hatteras, 110 foot pipe, manhole 34 – 34A
    Roots in almost every joint
    1 offset joint
    1 area of debris
    1 dip
22. Sandalwood between Bali and Andros, 102 foot pipe, manhole 49 → 49A
    Roots at 3 joints
    Sand in two areas; so bad in second area that camera could not get through – ended run.

MB Logs - Set 4

The following 20 inspection logs are contained in a single document, dated July 24 - 25, 2007, done by Video Inspection Specialists, Inc.

We did not review the tape covered by this set of logs, so there are no corresponding independent log sets.

Areas of Morro Bay Included:

This set of logs includes inspections of pipes in the downtown area lower Morro Heights, and a section of Ironwood Avenue adjacent to Highway 41.

Summary of Findings for This Set of Logs

These 20 inspections covered a total of 4,245 feet of pipe. One page of one log, covering 104 feet, was missing from the materials we received, and so we saw logs for, and will address problems found in the remaining 4,141 feet. – approximately **.**78 mile.

Problems identified in this set of logs include:

- **Roots in almost every joint in a total of about 2,520 feet of pipe, or about .48 mile. Any root infiltration at a joint indicates that there is separation and/or offset and/or cracking, because there must be an opening for roots to enter. If we assume joints at approximately every 8 feet, this would indicate that there are approximately 315 joints with some type of damage that has allowed roots to penetrate.**

For the most part, these logs did not identify the specific joint problems that allowed root infiltration. Other problems specifically identified include:

- **18 offsets**
- **7 cracks**
- **4 areas with grease**
- **2 areas with debris**
- **3 dips**

Summaries by Log

1. South on Napa from Harbor; 185 foot pipe, manhole 3 → 3A
   Roots at almost every joint
2. North on Napa from Harbor to Dunes – 83 foot pipe, manhole 3 → 2
   Roots almost every joint,
3. South on Napa from Harbor to Dunes, 263 foot pipe, manhole 2 → 3
   Not bad up to 212 feet; then roots in every joint.
4. North on Shasta from Harbor, 76 foot pipe, manhole 1 → 1A
   Roots in almost every joint
5. East on Harbor from Shasta, 256 foot pipe, manhole 1 → 1B
   Roots in most joints from 43 feet to 213 feet
   3 offsets
   1 crack
6. East on Morro Bay Blvd from Shasta, 201 foot pipe, manhole 47A → 47B
   Roots in most joints after 87 feet
   1 crack
7. West on Morro Bay Blvd. from Shasta to Napa, 146 foot pipe, manhole47A → 47
   Roots in most joints
   1 crack
   1 area of grease blockage
8. East on Morro Bay Blvd. form Monterey, 176 foot pipe, manhole 53 → 53B
   Roots in almost every joint
   2 offsets, one of them major
9. West on Morro Bay Blvd. Monterey to Main, 309 foot pipe, manhole 53 → 54
   Roots most joints in about 256 feet of the pipe

1 offset – in Y
1 area of grease
1 area of debris

10. North on Main from Harbor. 251 foot pipe, manhole 6A → 6
Roots in almost all joints
3 offsets
2 areas with grease
1 possible hole or service in top of pipe

11. Parking lot of Bay Auto Machine, 185 foot pipe, manhole 22 → 22A
Roots at two joints, 2 Y's
1 offset joint in Y

12, Parking lot of Bay Auto Machine, 185 foot pipe, manhole 22 → 23
1 dip
1 radial crack at joint
1 joint with infiltration

13. West on Morro Bay Blvc. From Bernardo, 280 foot pipe, manhole 27 → 28
Roots at most joints in about 132 feet of the pipe

14. West on Morro Bay Blvd. from Bernardo, 314 foot pipe, manhole 28 → 33
Roots in most joints
3 longitudinal cracks
4 offsets
1 joint with infiltration deposits

15. North on Piney from Morro Bay Blvd., 8 foot pipe, manhole 33 → 32
Pipe so "tuberculated" that cameral can't get through – only made it 8 feet in

16. South on Piney from Harbor, 151 foot pipe , manhole 32 → 33
Log incomplete – page missing from copy we received. Only have notes up to 47 feet.
Up to 47 feet, roots at 2 joints, and 1 dip

17. West on Ridgeway from Bernardo to Piney, 352 foot pipe, manhole 20 → 21
Roots at most joints from 127 to 331 feet
1 offset

18. North on Ironwood from Hwy 41, 200 foot pipe, manhole 7 → 7A
Roots at most joints from 127 feet to 159 feet.
Debris or root blockage at 200 feet

19. East on Hwy 41 from Ironwood, 315 foot pipe, manhole 6 → manhole 7
Roots at every joint 47 – 74 feet, 111 – 135 feet, 167 – 184 feet, several others
1 dip
3 offsets

20. West along Hwy 41, from Ironwood, 309 foot pipe, manhole 7 → 8
Roots in most joints, from 43 feet, on. Major blockage at 309 feet

Appendix B – Comparison of Independent and MB Logs

This is a comparison of our independently document logs of one of the videotaped inspections with the logs done by the contractor.

COMPARISON A

Independent

1. Main south of Island,
    2 offset joints
    1 crack
    1 major break and dislocation with radial cracking
    1 area of heavy grease, extends about 15 feet
    2 areas of debris, one of which stopped the camera

MB

9. Main, just south of Island, 98 foot pipe, manhole 73 → 1
    1 offset joint
    1 possibly tuberculated area
    1 hole
    1 break, with offset major enough to stop camera from passing

COMPARISON B

Independent

2. Main at Jamaica, going south, manholes 69 → 73
    Roots at most joints from 23 feet to 163 feet
    9 offset joints
    2 cracks
    1 offset joint with separation and radial crack
    5 joint dislocations, 1 major
    6 joint separations
    1 belly

MB

10. Main, from Jamaica, heading south, 225 foot pipe, manhole 69 → 73
    Roots at most joints 9 feet to 174 feet
    2 cracks

COMPARISON C

Independent

3. Alva Paul Creek to Sequoia, manhole 1 → 3
    61 offset joints, some severe
    6 separated joints
    5 joints with separation and offset
    9 Cracks, most are severe
    4 bellies
    1 manhole with pan missing

MB

11. Main between Alva Paul Creek and Sequoia, 725 foot pipe, manhole 1 → manhole 3 .
2 offset joints, 1 major
9 cracks
2 dips

COMPARISON D

Independent

4. Easement between Preston land and Little Morro Creek
Roots in several joints
18 offset joints
2 joints with offset and separation
1 separation
2 poorly connected lateral lines
1 area with multiple cracks, piece of line appears ready to come loose

MB

12. Easement between Preston and Little Morro Creek Road, 80 foot pipe, manhole 30 → 30A
Corresponds to Independent Logs, Set 2, item 4.
Roots at 3 joints
8 offset joints
1 crack

COMPARISON E

Independent

5. Koa, Conejo to San Juan, manhole 32 → 33 Corresponds to MB Logs, Set 3, item 13

10 offsets, 2 major, 4 minor
1 minor separation
2 joints with offset and separation

MB

13. South on Koa from Conejo to San Juan, 88 foot pipe, manhole 32 →
Roots at one joint

COMPARISON F

Independent

6. Laurel south from Avalon, manhole 76 – 76B
Roots in joints in about half of the pipe; two large root balls
11 offsets, 3 major, 2 minor
3 separations
1 area of cracking
1 dislocation
2 lateral connections too close together (weakens pipe), 1 dislocated, 1 plugged
1 large piece concrete debris

MB

14, South on Laurel from Avalon, 60 foot pipe, manhole 76 → 76B
Roots at 5 joints
3 offset joints

COMPARISON G

Independent

7. Kern, manhole 9 →7

Roots in most joints
23 offsets, 3 major, 1 minor
2 separations
5 areas with cracking, several severe, multiple cracks, 2 with piece of pipe loose
2 bad lateral connections
2 dislocated joint

MB

15. North on Kern Avenue, 127 foot pipe, manhole 9 → 7

Roots at almost every joint
6 offset joints
4 cracks
1 area with multiple cracks, described as “crushed”

COMPARISON H

Independent

8. Kern, manhole 7 → 9, going south

Roots at most joints, from 58 feet on, severe in several areas; 1 area where 80% of pipe is filled
24 offsets, 6 minor
33 separations, 2 major
1 joints with offset and separation
3 areas with cracking, one with piece of pipe loose, looks as if it could come out
2 bad lateral connections
1 manhole with missing pan

MB

16. South on Kern, 272 foot pipe, manhole 7 → 9

Roots at almost every joint from 58 feet, on
1 crack
1 dip