SAN BERNARDINO COUNTY

www.SBCounty.gov

SECTION G

SEWER TECHNICAL MEMORANDUM

COUNTY SERVICE AREA 82
SEARLES VALLEY
SEWER IMPROVEMENT PROJECT

FOR

COUNTY SERVICE AREA (CSA) 82,
TRONA, CALIFORNIA

PROJECT NO.: 30.30.0158

SEARLES VALLEY SEWER IMPROVEMENTS

SEWER TECHNICAL MEMORANDUM

Prepared For
San Bernardino County
Department of Public Works, Special Districts
222 W. Hospitality Lane, 2nd Floor
San Bernardino, CA 92415

Prepared By:

Samuel Lake McWhorter, P.E.
C 61788 Exp. 06/30/2025

Kimley-Horn and Associate, Inc.
401 B Street, Suite 600
San Diego, CA 92101

December 29, 2023

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

Figures

Tables

Abbreviations

ARPA ..... American Rescue Plan Act
CEQA..... California Environmental Quality Act
CSA ..... County Service Area
HDPE..... High-Density Polyethylene
LF.....Linear Feet
MH.....Manhole
OPCC..... Opinions of Probable Construction Costs
PG&E..... Pacific Gas and Electric
PVC..... Polyvinyl Chloride
SDR..... Standard Dimension Ratio
SCE..... Southern California Edison
TCE..... Temporary Construction Easement

THIS PAGE INTENTIONALLY LEFT BLANK

Attachments

Attachment 1 **Emergency Repair Limits**
CSA 82 Wastewater Facilities

Attachment 2 **Parcel Limits**
Parcel Maps

Attachment 3 **As-Builts and Surveyed Maps**
As-Built Drawings
Record Survey Information

Attachment 4 **Estimated Pipe Slopes and Manhole Spacing**
Manhole Tables

Attachment 5 **Flow Data**
Searles Domestic Water Company 2022 Data
1985 Sewer Study Data

Attachment 6 **Hydraulic Calculations**
Bentley Flowmaster Results

Attachment 7 **Opinion of Probable Construction Cost**
OPCC Calculations

Attachment 8 **Preliminary Sewer Invert Information**
Survey Dip Sheets

THIS PAGE INTENTIONALLY LEFT BLANK

1 PROJECT BACKGROUND

The County of San Bernardino Special Districts Department (Department) has contracted with Kimley-Horn to perform the analysis and design for the Searles Valley Sewer Improvements, or "Project."

The Project is located in the communities of Trona and Pioneer Point in County Service Area (CSA) 82 – Searles Valley, California, shown in **Figure 1-1 Vicinity Map**. The Trona and Pioneer Point areas are mining towns associated with Searles Valley Minerals Operations for various salts and other chemical deposits used for various industrial purposes. CSA 82 was established in 1976 under San Bernardino County (County) for the operation and maintenance of the sanitary sewer system.

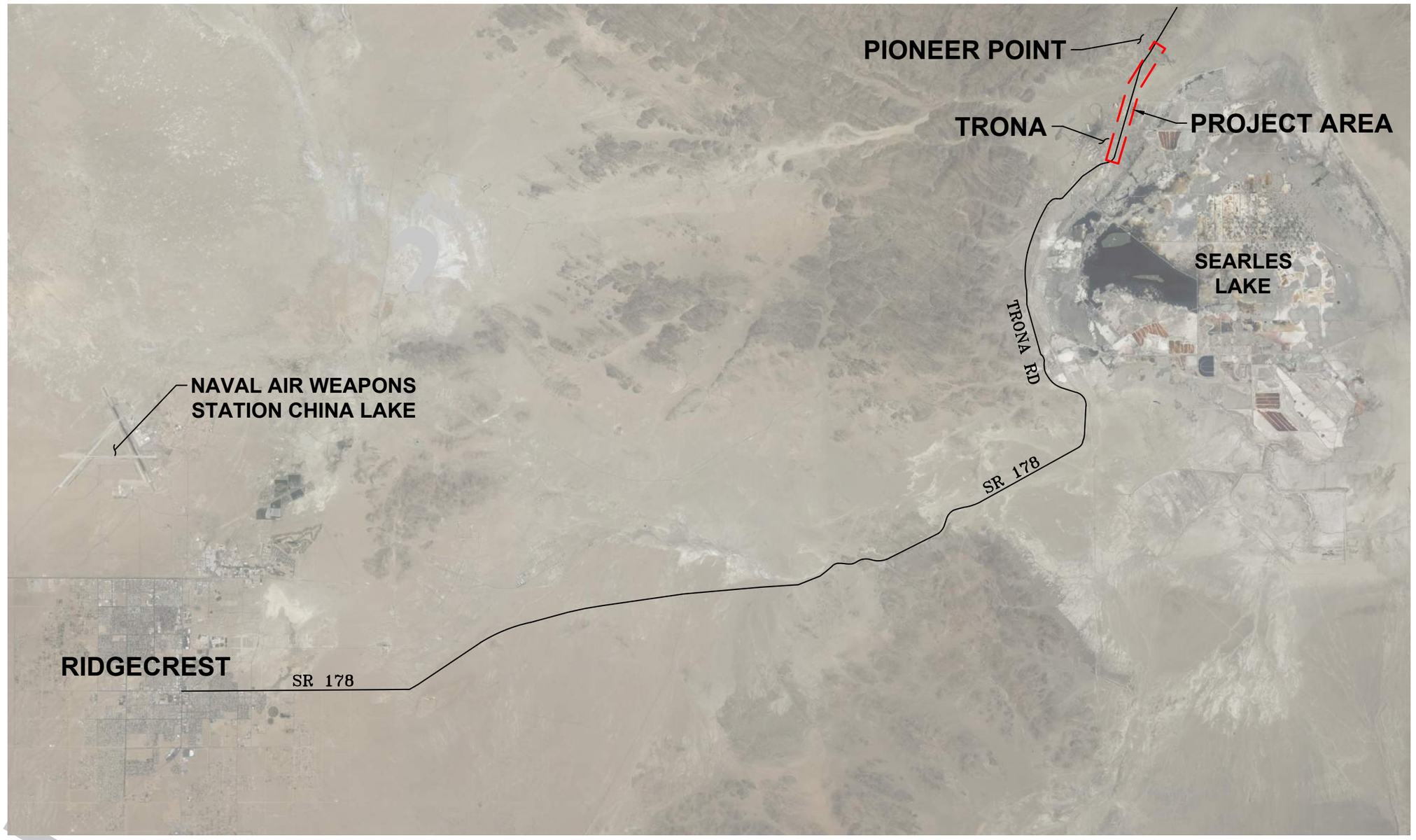
In the summer of 2019, two earthquakes, a 6.4 magnitude and subsequent 7.1 magnitude earthquake struck less than 30 miles from Trona. The earthquakes had significant adverse effects on the local infrastructure, including the 12-inch effluent sewer facilities that serve Trona. Several sewer main breaks and sections of sewer line subsidence (sags) occurred as a result of the earthquakes. Emergency repairs were performed a limited area impact, specifically for five (5) manholes along the sewer - as shown in **Attachment 1**.

The overall effluent sewer line still has a sag condition near Trona high school, and there are concerns with the conditions of the pipelines and manholes that were not rehabilitated as part of the initial emergency repairs.

This Project consists of reviewing approximately 11,300 linear feet (LF) of unrehabilitated pipeline and 13 manholes to prioritize which facilities should be replaced.

The Project limits are shown in **Figure 1-2 - Project Limits**. Approximately $5 million dollars of funds have been allocated from the American Rescue Plan Act (ARPA) for this Project.

THIS PAGE INTENTIONALLY LEFT BLANK



SEARLES VALLEY SEWER IMPROVEMENTS

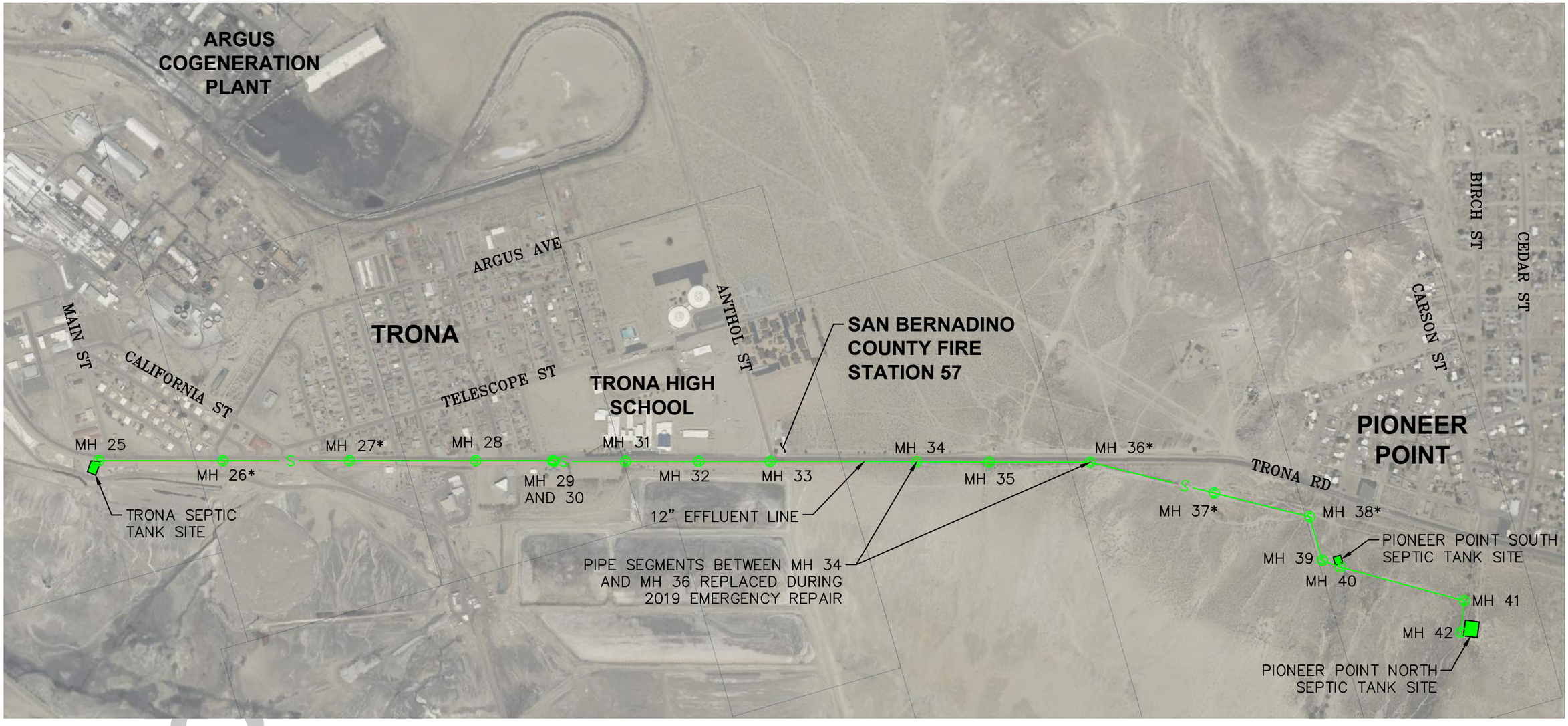
FIGURE 1: VICINITY MAP

Kimley»Horn
401 B STREET, SUITE 600,
SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

NORTH

JOB NO.: 195068124
DATE: 6/27/2023
0 5000 10000
GRAPHIC SCALE AS SHOWN

K:\SND_WATER\195068124 - SB COUNTY CSA 82 TRONA SEWER\DESIGN\PLANS\EXHIBITS\VICINITY MAP.DWG



LEGEND

- S — EXISTING SEWER ALIGNMENT
- MH 39 (S) EXISTING MANHOLE
- MH 38* (S) EXISTING MANHOLE REPLACED DURING THE 2019 EMERGENCY REPAIR

Kimley»Horn
401 B STREET, SUITE 600,
SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

SEARLES VALLEY SEWER IMPROVEMENTS

FIGURE 2: PROJECT LIMITS

NORTH

JOB NO.:	195068124
DATE:	6/27/2023

0 400 800
GRAPHIC SCALE AS SHOWN

2 DATA COLLECTION AND LOCAL SITE CONDITIONS

2.1 EXISTING SYSTEM AND ALIGNMENT

The existing Project sewer system consists of septic tank facilities at Pioneer Point and 12-inch diameter gravity effluent sewer pipe that conveys wastewater to the septic tanks at Trona. The 12-inch effluent sewer pipe largely consists of Truss Pipe with portions of SDR-35 PVC pipe that were installed as part of the emergency repairs. This Project's limits begin at Manhole (MH) 25 and end at MH 42, as shown in **Figure 2**-1. Manholes 26, 27, and 36-38 and pipe segments between MHs 34 -36 were replaced as part of the emergency repairs.

Most of the effluent sewer alignment is parallel to Trona Road located outside of the paved road limits. As a result, minimal traffic handling is expected as part of this project and Temporary Construction Easements (TCEs) are anticipated to be needed but the project does not plan to acquire permanent easements. During preliminary review of available Parcel Maps, provided in **Attachment 2** and available geographic information system (GIS) data, approximately 3,580 linear feet (LF) of the alignment is located within private property or other governmental ownership as shown in **Figure 2-1**. A possible 10' wide existing easement was noticed on the 1979 record drawings located in **Attachment 3** however specific information and original intent of that easement are not known.

A preliminary list of private property owners include:

- Searles Valley Minerals Operations 1
- Government Land
- San Bernardino County Flood Control District

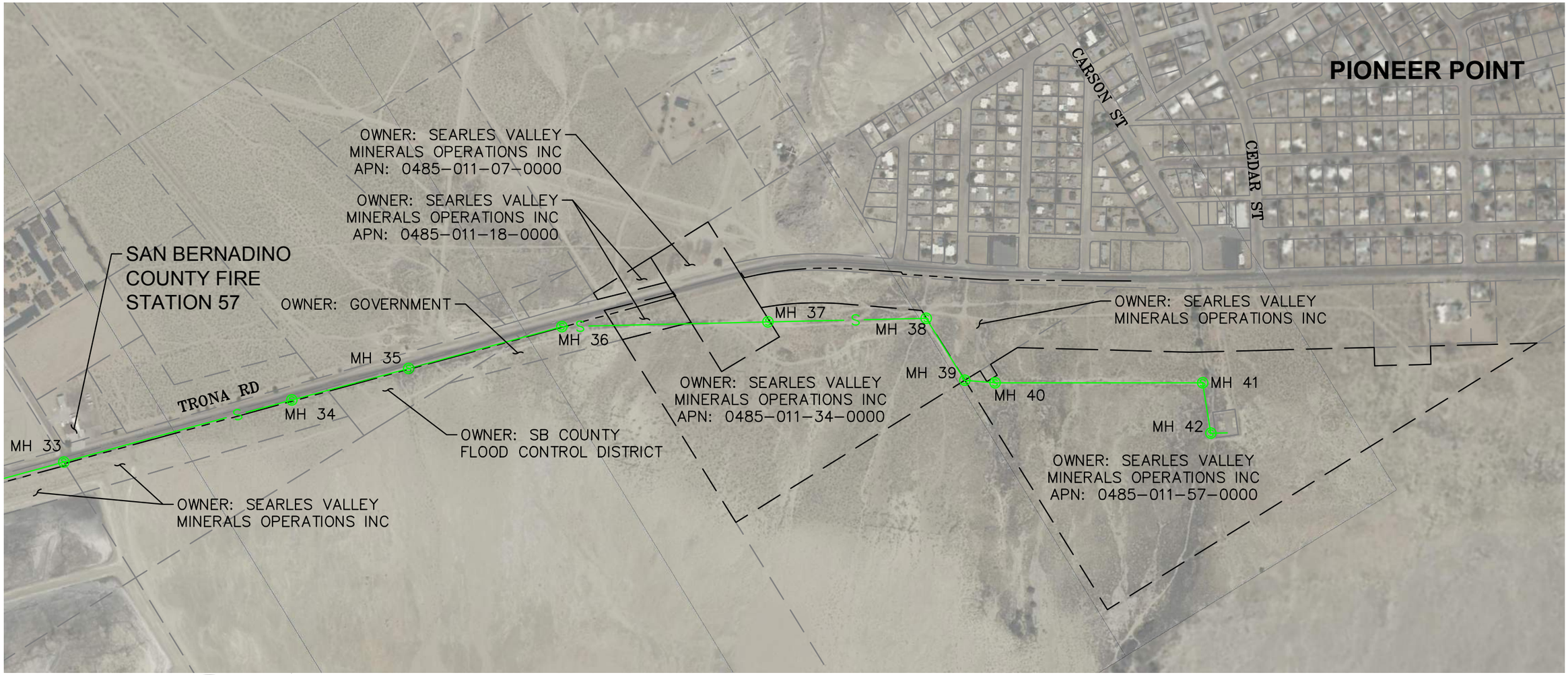
The Project alignment had sewer manhole depths measured, or "dipped" in 2017 and sewer televising performed in 2019 after the earthquakes. It was observed that several areas of the pipeline, specifically between MH's 27 to 33 near Trona High school, and MH's 37 to 40 are in a sag condition that is causing the sewer line to flow full (surcharge).

Surveyed manhole locations and available record drawings in **Attachment 3** show that the existing manhole spacing is greater than the County's current design standards and industry standards, with the median spacing approximately 673 feet apart, and a maximum spacing of 1,111 feet between manholes. Only three segments of pipe in this Project's alignment meet the County's design criteria of sewer manhole spacing of no greater than 300 linear feet (LF).

Pipe slopes were initially estimated based on available sewer manhole inverts and lengths from the 2017 survey information (**Attachment 3**). Survey data collected in 2023 revealed that existing slopes were much flatter than the record drawings indicated, averaging around 0.15% and with some negative slopes. The existing sewer has some areas of minimal cover, as shallow as 2.5', which will constrain the proposed sewer line but should not provide any major conflicts.

Several segments of pipe have negative pipe slopes and indicate potential areas of sag after the earthquakes in 2019.

Odors commonly associated with wastewater were noted near the Trona Septic facility. The origin is likely from the septic tanks and sewer facilities associated with this Project.



NO

LEGEND

- EXISTING SEWER ALIGNMENT
- ROAD RIGHT OF WAY
- ROAD CENTERLINE
- MH 36 EXISTING MANHOLE
- PARCEL BOUNDARIES
- PRIVATE PROPERTY PARCEL BOUNDARIES CONTAINING SEWER ALIGNMENT

Kimley»Horn
401 B STREET, SUITE 600,
SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

SEARLES VALLEY SEWER IMPROVEMENTS

FIGURE 3: ALIGNMENT WITHIN PRIVATE PROPERTY

NORTH

JOB NO.:	195068124
DATE:	6/27/2023

0 250 500
GRAPHIC SCALE AS SHOWN

2.1.1 SEWER TELEVISING

The effluent sewer is currently planned to be televised as part of this projects and is in the process of being scheduled. The purpose of the televising is to confirm the problematic areas that need improvement as part of this project.

2.1.2 SEWER INVERT INFORMATION

Preliminary Sewer Invert information was provided to Kimley-Horn by Calvada Surveying Inc. on 6/20/2023 and is provided in **Attachment 9**. Kimley-Horn has made the following observations:

- Several dipped manholes had either shallow standing water, or water that was above the bottom of the manhole shelf. This was observed in the downstream manholes between MH 24 to 34. Kimley-Horn was unable to determine if the elevated water elevations were due to downstream conditions, local sag conditions, slope issues, or other issues (such as broken joints or offset joints).
- Not all manholes could have sewer pipeline inverts measured due to the high-water elevations within the manholes.
- Several manholes that were able to be measured did not have any vertical drop between the influent and effluent sewer pipes. In some cases, the elevations seemed to flow in the opposite direction (see MH 37). Industry standard recommends sewer manholes have a minimum fall of 0.1 feet to provide smooth gravity flow through the sewer manhole.
- Manholes replaced in 2019 appeared to be in good condition.
- Manhole Covers replaced in 2019 had signs of corrosion and should be considered for replacement.
- A manhole shown on record drawings (Manhole #27) was not able to be located by County operators and survey during field reconnaissance. The existence and condition of this manhole are unconfirmed, but an approximate location is called out on the plans

2.2 EXISTING FLOW RATES

Limited flow information was available for the effluent sewer. Kimley-Horn reviewed raw Water Meter Data from the Searles Domestic Water Company and a preliminary sewer sizing document prepared by Wilson F. So & Associates, prepared in 1985.

2.2.1 SEARLES DOMESTIC WATER COMPANY – RAW WATER METER DATA

The raw Water Meter Data from the Searles Domestic Water Company for 2022 - **Attachment 5** was reviewed and summarized in **Table 2-1** - Summary of Flow Calculations from Searles Valley Water County Data below.

This flow data was used to estimate the average daily and peak flows in the system. The total metered flow for the months of January 2022 through June 2022 were reviewed. Each month was divided by 30.5 days and converted to average gallons per minute (GPM). A peaking factor of three (3) was applied to approximate the anticipated peak flow rates. The calculations are provided in **Table 2-1** below.

The calculations assumed the following:

- No water is lost between use and discharge. This is a conservative assumption, but also provides an offset to also account for any system Inflow and Infiltration (I&I) from broken joints or manhole cracks.

- All water discharges to the Trona Trunk Sewer associated with this Project.

Table 2–1 Summary of Flow Calculations from Searles Valley Water County Data

Month	Total Metered Gallons (assumed in months)	Gallons Per Day (GPD)	Average Gallons Per Minute (GPM)	Peak Flow (GPM)
January	2,813,228	92,237	64	192
February	3,232,856	105,995	74	221
March	3,282,224	107,614	75	224
April	3,544,024	116,198	81	242
May	4,453,592	146,019	101	304
June	5,620,472	184,278	128	384

Only 6-months of data were available for estimating the projected flow rates. In general, the water-use demand trends generally follow typical trends of lower use during winter months and higher use during summer months. On average, January 2022 experienced the lowest water demands with an average flow rate of 64 GPM and a peak flow rate of 192 GPM. June 2022 experienced the highest water demands with an average flow rate of 128 gpm and peak flow rate of 384 gpm.

Assuming 100% of the water use was returned to the sewer, the calculated flow rates were used to evaluate whether the existing 12-inch diameter pipe has adequate capacity for the existing flow rates, as well as identify minimum recommended slopes.

The Bentley FlowMaster computer program was used to review pipe hydraulics using the Manning's Formula and are provided in **Attachment 6**. A Manning's Roughness coefficient (n) of 0.010 was used for the PVC.

The following scenarios were modeled:

- The minimum slope needed to achieve a cleansing velocity of 2 Feet Per Second (fps) for the average flow condition (64 gpm) was determined to be 0.45%.
- The velocity for the average flow condition (64 gpm) at the shallowest slope of the existing system (0.03%) is 0.77 fps. The below minimum slope was modeled due to constraints from the existing upstream and downstream sewer connections.

Operators should consider inspecting and flushing this sewer pipe more frequently than may be typical due to the shallow slopes mentioned above. As this pipe is the effluent line form the septic systems, the wastewater should have less solids than typical residential sewer flows.

2.2.2 1985 SEWER STUDY FLOW ESTIMATES

Wilson F. So & Associates prepared the Summary Report Pioneer Point – Trona Sewer System Study (Study), dated January 1985 that estimated wastewater flows for Pioneer Point and Trona – provided in **Attachment 5**. The study, in our opinion, appeared to be intended for sizing the local collection systems (6-inch to 10-inch diameter pipes) within each town and did not analyze the effluent 12-inch diameter trunk sewer that is part of this Project.

The Study used the planned land use areas – a mix of residential, commercial, and school facilities for each region to estimate the peak flow rate for each system. Pioneer Point was estimated to generate an average flow rate of 0.21 MGD and peak flow rate of 0.64 MGD. Trona was estimated to generate an average flow

rate of 0.16 MGD and peak flow rate of 0.50 MGD. Based on population trends between 1985 and today, it is likely that the sewer study flows are conservative and overestimate current conditions.

The flow rates from the report were used to evaluate whether the existing 12-inch diameter pipe has adequate capacity, as well as identify minimum recommended slopes. Bentley FlowMaster was used to review pipe hydraulics using the Manning Formula and are provided in **Attachment 6**. An n of 0.010 was used for the roughness coefficient since PVC pipe is proposed for the replacement material.

The following scenarios were modeled:

- Pioneer Point
    - The minimum slope needed to achieve a cleansing velocity of 2 feet per second (fps) for the low flow condition (0.16 MGD) was determined to be 0.28%
- Trona
    - The minimum slope needed to achieve a cleansing velocity of 2 feet per second (fps) for the low flow condition (0.21 MGD) was determined to be 0.23%

Based on operator observations as well as the hydraulic calculations, Kimley-Horn does not believe changing the diameter of the existing 12-inch gravity sewer pipes will provide benefit to the system.

The County's minimum slope for a 12-inch diameter pipe is 0.22% based on the County Design Standards for Sanitary Sewer dated November 13, 2012.

From the estimated flow rates and proposed pipe size, a minimum pipe slope of 0.45% would be needed to achieve adequate 2 fps velocities.

2.3 EXISTING UTILITY INFORMATION

Kimley-Horn performed Utility Base mapping Research and coordination with various utility agencies in the Project vicinity. Currently available utility drawings and as-builts are provided in **Attachment 3**. Since this project is generally a replace in place project, potential utility conflicts are expected to be minimal. The following utilities may be encountered:

2.3.1 GAS

2.3.1.1 PACIFIC GAS AND ELECTRIC (PG&E)

Distribution and service laterals are expected based on PG&E gas maps received. Most gas lines are along the westerly side of Trona Road over 20 feet away from the existing sewer line and are not expected to provide significant conflicts other than a couple gas and electric crossings.

2.3.1.2 FRONTIER

Frontier is a natural gas purveyor. Kimley-Horn is in the process of obtaining maps for the complete Project area, but preliminary maps show copper facilities generally located along the western side of Trona Road. Gas valves and markers will assist with locating the gas lateral locations, but there is a possibility for some of the natural gas lines to run parallel or cross the Project alignment near Trona.

2.3.1 ELECTRICAL – SOUTHERN CALIFORNIA EDISON (SCE)

In general, the majority of electrical utilities near the existing alignment are overhead power poles which do run across the existing sewer line at a few locations but should not create any conflicts. Some small diameter underground conductors cross Trona Road, but are not expected to provide significant conflicts.

The sewer alignment is generally parallel to the overhead electrical lines on the east side of Trona Road, as shown in **Figure 2-2**. Survey shows that there should be no conflicts with the proposed sewer line and power poles, and there should be no issue protecting these in place.

Figure **2–2** Sewer Manhole and Overhead Utilities – view facing North

2.3.2 WATER - SEARLES DOMESTIC WATER COUNTY

Searles Domestic Water County is the purveyor of water utilities in the Project Vicinity and records obtained show an existing 6-inch water line running parallel to the existing sewer alignment on the eastern side of Trona Road with a couple points of crossing near Aster Street and Verbena Street.

2.3.3 SEWER - SAN BERNARDINO COUNTY – SPECIAL DISTRICTS

San Bernardino County – Special Districts owns and operates the other sewer facilities in the Project Vicinity as part of CSA 82. In general, the 12-inch sewer in this Project's limits do not collect flow from other systems.

MH 33 at Athol Street receives flow from an 8-inch diameter sewer and MH 31 receives flow from a 12-inch diameter sewer from Trona High School. In general, all other sewer lines run parallel along the west side of this Project's effluent sewer system. The parallel sewer lines consist of a majority 8-inch line with some

10-inch sewers and ultimately discharge to the Trona Septic Tanks near MH 25. There are a few existing sewer crossings at multiple locations which are not expected to provide significant conflicts.

The existing gravity sewer system which collects residences from Trona and Pioneer Point are shown on the Searles Valley Wastewater Facility Improvement Plans from 1979 to be 3 feet separated from the proposed effluent sewer replacement. While the County's current design criteria calls for 5 feet minimum separation, this design replaces the effluent line in place. Replacing in place ensures minimal conflicts with existing utilities, minimal added infrastructure needed to connect to the downstream system and maintains the initial alignment where the pipe crosses private land.

There are also existing brine lines of various sizes that cross the existing sewer line near Telescope Avenue and another 27 inch brine line crossing near Magnolia Avenue.

2.3.4 DRAINAGE – SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT

San Bernardino County – Flood Control District owns and operates the drainage facilities in the Project Vicinity. While Kimley-Horn is aware of a segment of pipe between MH 36 and MH 37 that passes through a Flood Control District easement, Kimley-Horn has not been able to obtain records from the SB County Flood Control District to verify the specific limits of the drainage facilities. At Flood Control District's request the manhole proposed within SBFCD's ROW will include a district standard concrete apron.

2.3.5 COMMUNICATIONS - FRONTIER

Frontier is the communications purveyor in the Project Vicinity. Kimley-Horn is in the process of obtaining maps for the complete Project area, but preliminary maps show communication facilities generally located along the western side of Trona Road.

2.4 CORROSIVE ENVIRONMENT

Searles Valley was developed largely around the mining of salts in the local area. Due to the high salt content, the local environment is extremely corrosive. Based on discussions with District Staff as well as Kimley-Horn's field observations, exposed metallic manholes corrode at higher than typical rate.

Figure 2-3 shows a manhole installed after the 2019 earthquakes as part of the emergency repairs. The manhole cover is less than 5 years old and shows significant signs of corrosion and wear. Additionally, seized manhole lids are difficult to open without damaging the top of the manhole riser.

Figure **2–3** Sewer Manhole and Cover Replaced in 2019

2.5 LOCAL SOILS AND GEOTECHNICAL CONDITIONS

Kimley-Horn will review Ninyo and Moore's report and investigation when available and make appropriate design updates when received.

Kimley-Horn expects the potential for highly corrosive soils, potential for settling, and potential for groundwater to be encountered based on our review of available information for the project.

3 PROPOSED DESIGN

Based on the available data, Kimley-Horn has the following recommendations for pipe material selection, pipe size and minimum slopes, manhole design, phasing and prioritization of segments.

Kimley-Horn recommends the following sewer system design:

- The County's minimum slope for 12-inch diameter pipes is 0.22% and was not able to be achieved given the upstream and downstream tie-in elevation constraints.
    - Two options were analyzed to improve slopes:
        - Installation of a sewer lift station downstream
        - Daylighting grading of the effluent channel downstream to allow steeper pipe segments to be installed.
    - Both options were reviewed by Kimley-Horn in consultation with the County and it was determined not to be feasible due to the following factors:
        - Increased cost for the installation of a lift station
        - Added maintenance of a lift station
        - Need for electrical service for a lift station
        - Extensive daylight grading for deeper pipe outlet option
        - Increased cost of a deeper sewer to improve slope
- A minimum pipe slope of 0.05% based on the available fall from the beginning (upstream) to end (downstream) of the project was recommended and approved by the County.
- A minimum pipe cover of 5 feet is proposed where possible.
- A minimum drop of 0.1 feet through the proposed sewer manholes, with a recommended 0.2 feet drop where possible.
- A minimum 4-foot diameter sewer manhole.

Kimley-Horn understands that approximately 1,613 LF of sewer pipeline was replaced during the 2019 emergency repairs. Kimley-Horn attempted to minimize replacing these pipes, however replacing these segments is needed to improve the overall pipe profile for the length of the project.

3.1 PIPE MATERIAL SELECTION

Due to the corrosive nature of the soils in the project, Kimley-Horn recommends plastic pipes such as Polyvinyl Chloride (PVC) or Butt-Fused High-Density Polyethylene (HDPE) be used. **Table 3-1** compares Advantages and Disadvantages for each pipe material.

Table 3–1 Advantages and Disadvantages between PVC and HDPE

Material	Advantages	Disadvantages
PVC	• Less expensive than HDPE • Flexible Pipe • Inert Material – Not affected by the local corrosive soils. • PVC – regardless of class or thickness is typically more widely available and easier to obtain for repairs or replacement in the future.	• If groundwater is encountered, I&I is possible if standard bell and spigot joints are used • Less flexible than HDPE and more susceptible to cracks or breaks during seismic activity.
Butt-Fused HDPE	• Flexible Pipe • Inert Material – Not affected by the local corrosive soils. • More durable and flexible pipe that may be able to withstand seismic activity or settling better than PVC	• Higher Unit Cost • Requires a specialty contractor for butt fused joints. • Not as readily available off the shelf

Kimley-Horn proposes the use of PVC pipe SDR-26. Pipe material such as SDR-26 PVC is practical since most contractors are familiar with this pipe material and construction, it can be installed efficiently, is generally more cost effective, and typically more available for any repairs in the future. SDR-26 was chosen over SDR-35 due to the thicker wall (1/3 thicker than SDR-35 at 0.481-inch) which we believe will perform better in the long term given the following: field conditions, portions of shallow depth, potential for future seismic activity.

Butt-fused HDPE is flexible and more likely to withstand major future seismic events but is more expensive and requires a specialty contractor for installations and repair.

3.2 PIPE BEDDING

Based on sag conditions in system after the 2019 earthquakes, the soils in this area may be subject to future settling. While this is to be confirmed based on the pending geotechnical investigation, Kimley-Horn will review Ninyo and Moore's recommendations regarding soil conditions and any modifications to pipe bedding other than the standard pipe beddings from the San Bernardino County Standard Drawings for Sanitary Sewers E-18, and San Bernardino County 2019 General Permit Conditions and Trench Specifications.

3.3 MANHOLE DESIGN

The County has requested the use of Armorock precast polymer concrete manholes or approved equal. Kimley-Horn agrees that the use of polymer concrete manholes is advised due to the highly corrosive local soil conditions. Additionally, the sewer system may experience high levels of hydrogen sulfide (H_2S) due to potentially low flow conditions. H_2S gasses are corrosive and can degrade concrete and metal components. Polymer concrete will be more durable in these types of conditions.

The County's Design Standard for sewer manhole spacing is no greater than 300 linear feet (LF), but the majority of manholes in this Project's alignment exceed the 300 LF spacing. Kimley-Horn has reviewed the available survey information and included four (4) Alternatives for manhole replacement:

- Alternative 1 – Replace Manholes in place – No new Manholes

- Alternative 2 – Install intermediate manholes
- Alternative 3 – Install manholes approximately every 300 to 400 LF
- Alternative 4 – Install manholes to achieve no more than 300 LF between manholes and meet the County's design standards

Each alternative is reviewed in more detail below.

3.3.1 ALTERNATIVE 1 – REPLACE MANHOLES IN PLACE

Alternative 1 – Replace Manholes in Place includes solely replacing the existing 18 manholes in place. This alternative is the most cost-effective method since it includes the least amount of manholes to be installed.

Alternative 1 has the least risk of utility conflicts since the project would be solely replace in place.

A disadvantage of Alternative 1 includes less control over vertical improvements that will be implemented as part of this project. While vertical changes can be made, more manholes can optimize cover and slopes since there are more opportunities to introduce grade breaks.

We understand from coordination from the County that this is the preferred Alternative for this project.

3.3.2 ALTERNATIVE 2 – INSTALL INTERIM MANHOLES

Alternative 2 – Install Interim manholes includes generally installing one additional manhole between segments greater than 300 LF in the existing condition.

A total of 31 manholes, or an additional 13 manholes are proposed. This would reduce the median and longest lengths of pipe segments from 673 LF and 1,111 LF to 399 LF and 556 LF respectively.

An advantage of Alternative 2 includes more control over vertical improvements by allowing for more places for vertical grade breaks. Though unlikely due to the limited utilities in this area, it possible that new manholes could encounter utility conflicts.

A disadvantage of this option is the increased cost of the additional manholes.

3.3.3 ALTERNATIVE 3 – INSTALL INTERIM MANHOLES EVERY 300-400 LF

Alternative 3 – Install Interim manholes such that the majority of manholes are between 300 to 400 LF apart. A total of 36 manholes, or an additional 18 manholes are proposed. This would reduce the median and longest lengths of pipe segments from 673 LF and 1,111 LF to 333 LF and 408 LF respectively.

While not all segments would achieve the County's sewer design standards of no more than 300 LF between manholes, the additional manholes would provide greater operator access for maintenance.

An advantage of Alternative 3 includes more control over vertical improvements by allowing for more places for vertical grade breaks. Though unlikely due to the limited utilities in this area, it possible that new manholes could encounter utility conflicts.

A disadvantage of this option is the increased cost of the additional manholes.

3.3.4 ALTERNATIVE 4 – INSTALL INTERIM MANHOLES NO MORE THAN 300 LF APART

Alternative 4 – Install Interim manholes includes generally installing manholes to achieve segments no greater than 300 LF apart to meet the County's design standard. A total of 46 manholes, or an additional 28 manholes are proposed.

This would reduce the median and longest lengths of pipe segments from 673 LF and 1,111 LF to 262 LF and 305 LF respectively. Only two pipe segments would exceed the 300 LF County Design standard.

An advantage of Alternative 4 includes more control over vertical improvements by allowing for more places for vertical grade breaks. Though unlikely due to the limited utilities in this area, it possible that new manholes could encounter utility conflicts.

A disadvantage of this option is the increased cost of the additional manholes.

3.3.5 RECOMMENDATION

Kimley-Horn recommends Alternative 1 for this project to help maximize the amount of improvements that can be made within the budget. This Alternative helps balance the budget and the overall goals of the project. We understand that the County also prefers Alternative 1 – to replace the manholes at the same location they currently exist.

4 POTENTIAL CONSTRAINTS

4.1 ENVIRONMENTAL CONSTRAINTS

It is Kimley-Horn's understanding the County will prepare their own environmental documentation. The Project is expected to be a Categorical Exemption under CEQA 15301 existing facilities (b), even if additional manholes are added for accessibility since the capacity, alignment, and sewer pipeline will remain the same. This is pending review from County Environmental staff.

4.2 RIGHT OF WAY AND PRIVATE PROPERTY CONSTRAINTS

Approximately 3,580 LF of sewer line is within private property. Based on recent discussions with County operators, the current owners allow operator access for maintenance. It is unknown if there are formal agreements between the private property owners and the County regarding access to the sewer systems.

Kimley-Horn recommends the County consult with their internal Right-of-Way and legal department to confirm if easements exist or if they are needed. Easement acquisition may introduce schedule delays.

During the replacement of this sewer system, Temporary Construction Easements (TCE's) may be required to perform construction within private property. Kimley-Horn recommends the County review any legal agreements between the private property owners and the County to understand their access to these existing facilities during construction.

4.3 POTENTIAL GROUNDWATER CONSTRAINTS

Pioneer Point and Trona are located next to Searles Lake. Typically, Searles Lake is dry, but the local groundwater elevations are unknown. We understand that groundwater was not encountered during the emergency repairs in 2019.

While considered unlikely, if shallow groundwater is encountered, additional construction costs could be significant.

5 OPINION OF PROBABLE CONSTRUCTION COSTS

Kimley-Horn has prepared Opinions of Probable Construction Costs (OPCC) for each of the four (4) Alternatives described in this report. The OPCCs include Mobilization, sewer bypass, SDR-26 PVC Pipe, Armorock or approved equal polymer concrete manholes, corrosion resistant manhole covers, and general site restoration. A construction duration dewatering period of 60-working days was assumed to estimate the Sewer Bypass and Groundwater Dewatering costs, if encountered.

Estimated Construction Costs for each alternative, including and excluding groundwater dewatering are included in **Table 5-1** below.

Table 5–1 Comparison of OPCCs for each Alternative

Alternative	Estimated Construction Cost	Estimated Construction Cost with Groundwater Dewatering
1 – Replace Manholes in Place	**$5,490,000**	**$6,060,000**
2 – Install Interim Manholes for segments greater than 300 LF	$5,720,000	$6,290,000
3 – Install Manholes approximately every 300-400 LF	$5,830,000	$6,400,000
4 – Install Manholes no more than 300 LF apart to meet the County's Design Standards	$6,050,000	$6,620,000

Detailed OPCC's for each Alternative are provided in **Attachment 7**.

6 RECOMMENDATIONS

Kimley-Horn recommends the use of 12-inch SDR-26 PVC Pipe, Armorock Polymer Concrete Manholes or approved equal, and corrosion resistant manhole covers.

Polymer Concrete manholes and corrosion resistant manholes such as Fiber Reinforced Polymer (FRP) or other alternatives will minimize corrosion from H_2S gases and the local corrosive soils. Installing infrastructure that is more resistant to the local conditions will provide a longer life span for the manholes and covers, as well as improve operator access for maintenance and observation in the future.

Kimley-Horn recommends Alternative 1 for the manhole spacing – replace in place based on coordination with the County.

7 REFERENCES

[1] Standards for Sanitary Sewer. County of San Bernardino Special Districts Department, 2012

[2] Open-Channel Hydraulics. Ven Te Chow. McGraw-Hill, New York, 1959.

8 ATTACHMENTS

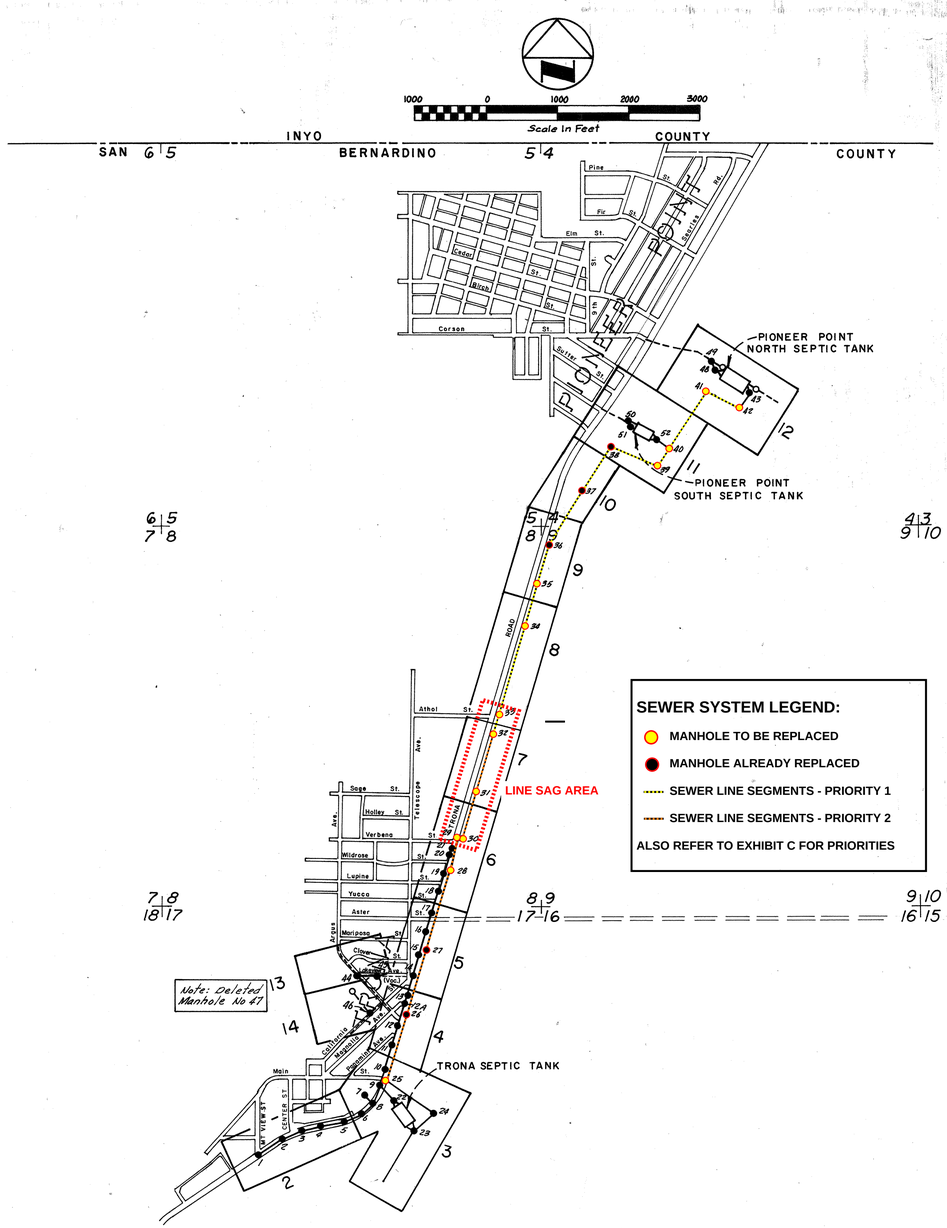
THIS PAGE INTENTIONALLY LEFT BLANK

ATTACHMENT 1 – EMERGENCY REPAIR LIMITS

CSA 82 WASTEWATER FACILITIES

THIS PAGE INTENTIONALLY LEFT BLANK

NOT FOR BID



REVISED TO "AS BUILT" CONDITIONS
Date 11-18-80

EXHIBIT B

CSA 82 - SEARLES VALLEY
ARPA SEWER SYSTEM IMPROVEMENTS
SEWER SITE PLAN NOT TO SCALE

Revision	No.	By	Date	Appr.
Revised to "As Built" Conditions	⚠	WS	11-18-80	RF

Submitted By:
R. C. E. No. 27,485
2/23/79 Date

Designed E.Shaw & P.Leja. Checked J.R.D.
Drawn L.R.M. Job No. 05-78-01

ENGINEERING ASSOCIATES
Mail P. O. Box 6087 · 92412
Phone (714) 884-8804 or (714) 825-9562
225 East Airport Drive, San Bernardino, California

COUNTY OF SAN BERNARDINO
COUNTY SERVICE AREA 82
WASTEWATER FACILITIES

SEARLES VALLEY
INDEX MAP
Sheet 1 of 19 Sheets
Dwg. No.

5-78-01(ESS)

ATTACHMENT 2 – PARCEL LIMITS

PARCEL MAPS

THIS PAGE INTENTIONALLY LEFT BLANK

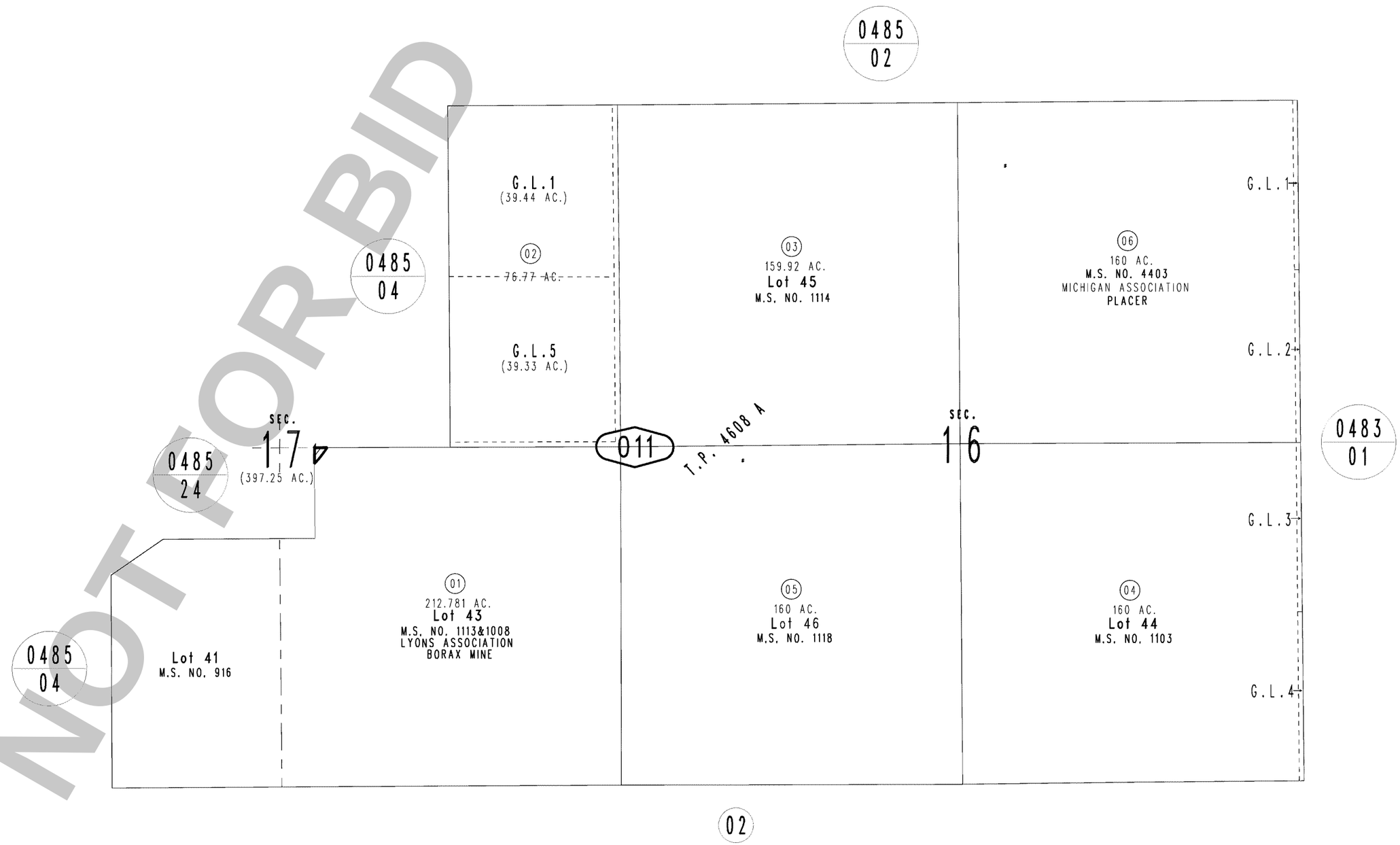
THIS MAP IS FOR THE PURPOSE OF AD VALOREM TAXATION ONLY.

Ptn. Fractional Sec.16&17, T.25S.,R.43E., M.D.B.&M.
Ptn. Tract No. 50, T.P. 4608 A

Trona Unified
Tax Rate Area
111000

0486 - 01

1"=800'



May 2005

REVISED

Assessor's Map
Book 0486 Page 01
San Bernardino County

11-17-93
08-07-96

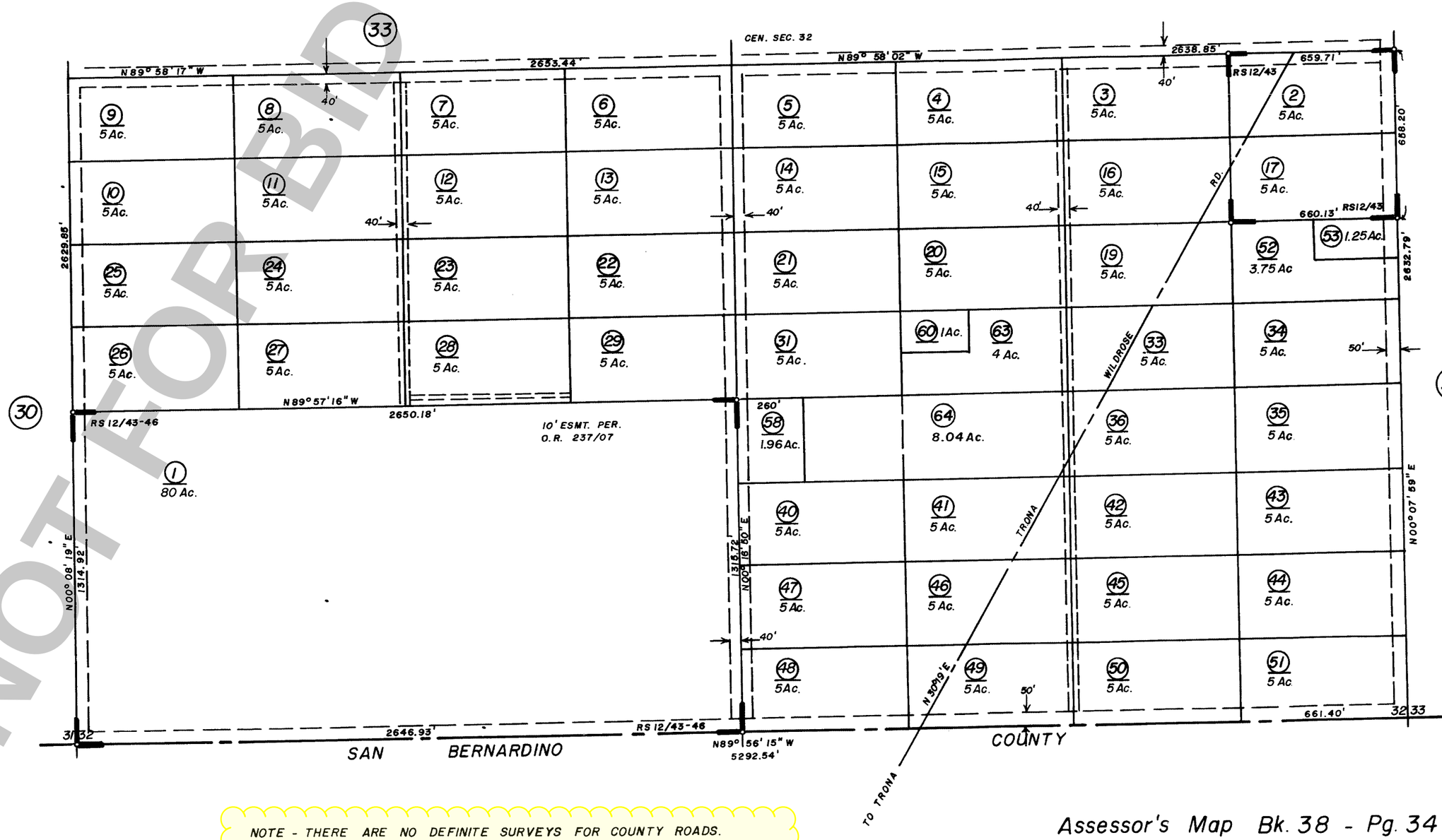
S 1/2 SEC. 32, T. 24 S., R. 43 E., M. D. B. & M.

BLM SMALL TRACT CLASSIFICATION - CALIFORNIA NO. 128

TAX RATE AREA
67 - 001

38 - 34

1" = 400'



NOTE - THERE ARE NO DEFINITE SURVEYS FOR COUNTY ROADS.
LOCATIONS ARE APPROXIMATE.
R.S. Bk. 12 Pgs. 43 - 46

Assessor's Map Bk. 38 - Pg. 34
County of Inyo, Calif.
1963

08-07-96

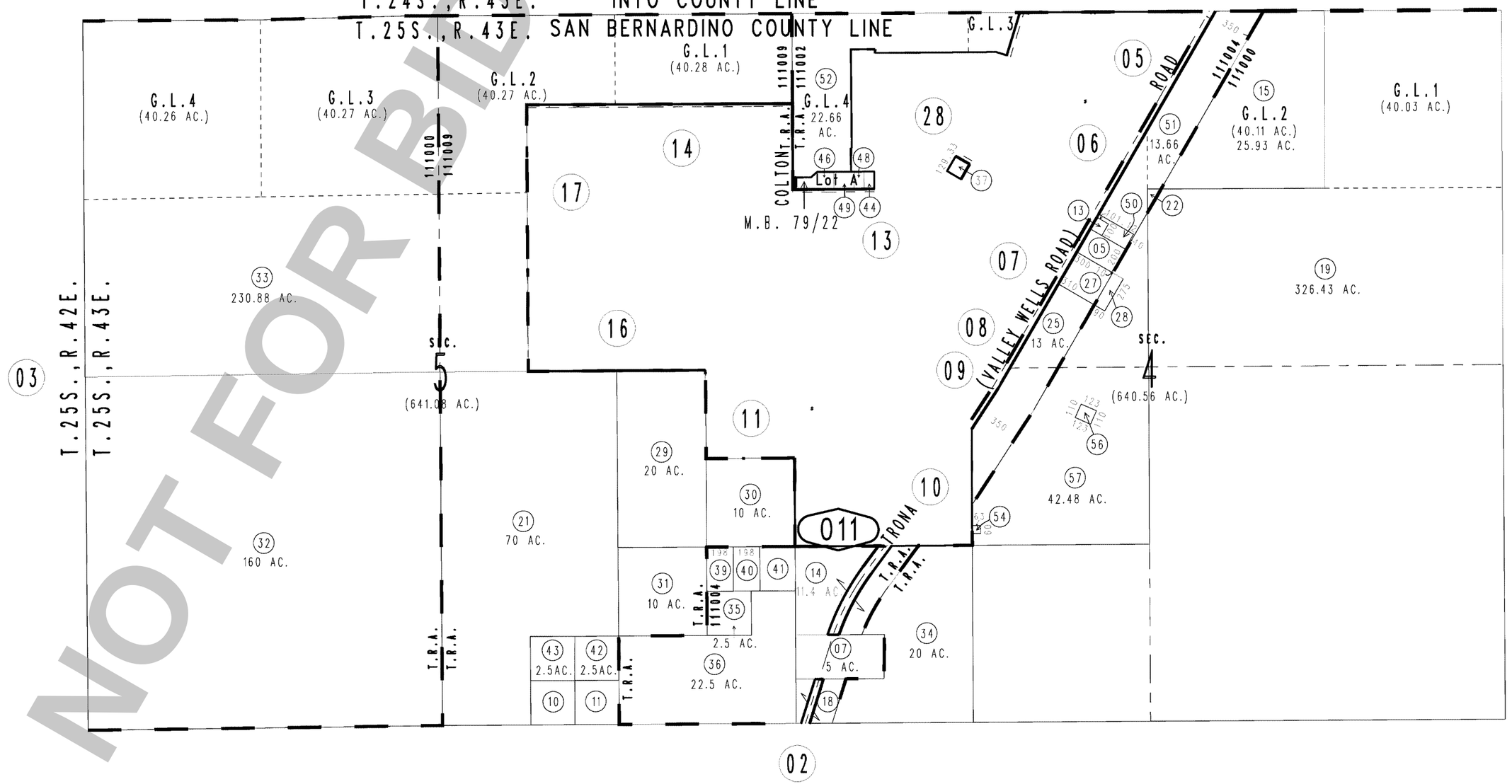
THIS MAP IS FOR THE PURPOSE OF AD VALOREM TAXATION ONLY.

Ptn. Fractional Sec.4&5, T.25S.,R.43E., M.D.B.&M.

Trona Unified
Tax Rate Area
111000,111002
111004,111009

0485- 01

1"=800'



0483
01

May 2005

Lot A, Tract No. 6389, M.B. 79/22

REVISED

Assessor's Map
Book 0485 Page 01
San Bernardino County

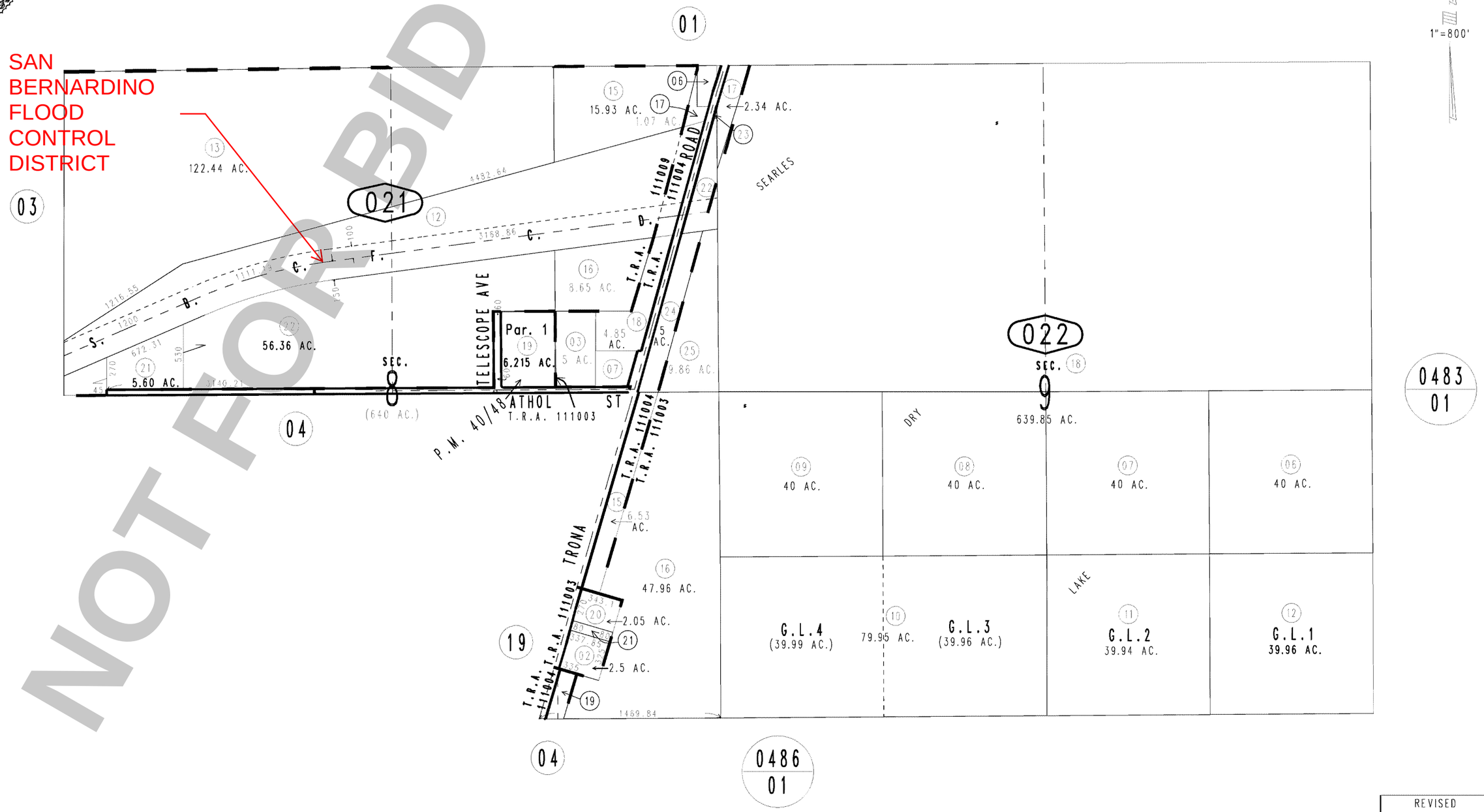
THIS MAP IS FOR THE PURPOSE OF AD VALOREM TAXATION ONLY.

Ptn. Sec.8, Fractional Sec.9, T.25S.,R.43E., M.D.B.&M.

Trona Unified
Tax Rate Area
111000,111003
111004,111009

0485 - 02

1"=800'



May 2005

Parcel Map No. 4212, P.M. 40/48

REVISED
07/02/08 GW
01/21/10 LH

Assessor's Map
Book 0485 Page 02
San Bernardino County

ATTACHMENT 3 – AS-BUILTS AND SURVEYED MANHOLES

AS-BUILT DRAWINGS

RECORD SURVEY INFORMATION

THIS PAGE INTENTIONALLY LEFT BLANK

NOT FOR BID

ZONE I

SIXTH STANDARD LINE SOUTH MOUNT DIABLO MERIDIAN

1" = 200'

LEGEND

ZONE BOUNDARY

DISTRICT BOUNDARY

ZONE 2

MAY 2 3 1986

FIGURE 2

PIONEER POINT SEWER SYSTEM MAP

NOT FOR BID

SCALE: 1" = 200'

C.S.A. 82 (SV4) BOUNDARY

ASSET 11: MH 114 TO MH 113

SEE SHEET 2

MANHOLE SCHEDULE

M.H. No.	RIM ELEV.	INVERT ELEV.
1	1650.37	1644.70
1–A	1653.09	1646.19
2	1656.28	1649.53
3	1656.76	1651.16
4	1658.00	1652.50
5	1659.07	1653.62
6	1661.33	1655.18
7	1663.44	1657.44
8	1666.64	1660.68
9	1666.29	1659.79
10	1667.72	1661.02
11	1667.76	1663.44 W. 1661.54 S. 1661.81 E.
12	1673.73	1669.58
13	1681.96	1677.72
16	1661.25	1654.97
17	1662.13	1656.55
18	1663.22	1657.77
19	1665.31	1659.79
20	1667.60	1662.17
21	1668.79	1664.29
22	1671.98	1666.68 S. 1666.70 N.
23	1673.46	1668.74
25	1686.13	1679.97
26	1665.72	1663.22
27	1666.38	1658.68
28	1669.09	1662.29
29	1671.03	1665.26 S. 1665.46 N.
30	1674.34	1668.34 W. 1668.10 S.&N.
31	1675.23	1670.08
32	1678.59	1672.69
33	1680.00	1675.16 S. 1675.12 N.
35	1672.63	1666.93
36	1676.95	1672.55 S. 1672.57 N.
38	1685.81	1681.51
39	1682.27	1677.02
49	1646.30	1641.85
50	1645.43	1641.23
100	1645.06	1641.61
101	1647.59	1642.69
102	1650.78	1644.78
103	1649.80	1646.25
103A		
104	1650.72	1647.82
105	1663.13	1658.43
106	1650.87	1645.72
107	1655.10	1651.15
108	1651.61	1647.13
109	1658.13	1654.08
110	1668.13	1663.03
111	1653.92	1650.10
112	1659.37	1655.07
113	1664.23	1659.08
114	1668.02	1662.02
115	1655.43	1652.53
117	1669.73	1664.82 S. 1665.03 N.
118	1669.69	1664.79
119	1673.10	1669.12
121	1691.20	1687.65
122	1694.80	1691.00
200	1693.49	1685.29
201	1703.77	1695.62
202	1713.82	1705.78
205	1695.29	1687.30
206	1688.96	1680.86
207	1684.13	1677.08
208	1690.20	1682.25
209	1694.42	1686.37
210	1692.91	1684.81
211	1700.34	1690.89
212	1679.99	1676.09
213	1682.71	1678.56
214	1668.16	1662.61

LEGEND

- C.S.A. 82 BOUNDARY
- 214 — MANHOLE (NUMBER, REFER TO MANHOLE SCHEDULE FOR RIM & INVERT ELEVATIONS)
- C.O. — CLEANOUT
- 268 — PARCEL ID No. (REFER TO PARCEL IDENTIFICATION SCHEDULE FOR A.P.N. No.)
- IMPROVED PARCEL
- 200' — 4–INCH SEWER & LENGTH
- 200' — 6–INCH SEWER & LENGTH
- 200' — 8–INCH SEWER & LENGTH
- 200' — 10–INCH SEWER & LENGTH
- 200' — 12–INCH SEWER & LENGTH

PARCEL IDENTIFICATION SCHEDULE

ID No.	A.P.N. No.
1	485–011–37
2	485–011–44
3	485–011–46
4	485–011–48
5	485–011–49
6	485–011–52
9	485–051–02
10	485–051–03
11	485–051–04
12	485–051–05
13	485–051–06
14	485–051–07
15	485–051–08
16	485–051–09
17	485–051–10
18	485–051–11
19	485–051–12
20	485–052–02
21	485–052–03
22	485–052–04
23	485–052–07
24	485–052–08
25	485–052–09
26	485–052–11
27	485–052–12
28	485–052–13
29	485–053–01
30	485–053–02
31	485–053–03
32	485–053–04
33	485–053–05
34	485–053–06
35	485–053–07
36	485–053–08
37	485–053–09
38	485–053–10
39	485–053–11
40	485–053–12
41	485–053–13
42	485–054–01
43	485–054–02
44	485–054–03
45	485–054–04
46	485–054–05
47	485–054–06
48	485–054–07
49	485–054–08
50	485–054–09
51	485–054–10
52	485–054–11
53	485–054–12
54	485–061–01
55	485–061–02
56	485–061–03
57	485–061–04
58	485–061–05
59	485–061–06
60	485–061–07
61	485–061–08
62	485–061–09
63	485–061–10
64	485–061–11
65	485–061–12
66	485–061–13
67	485–062–01
68	485–062–02
69	485–062–03
70	485–062–04
71	485–062–05
72	485–062–06
73	485–062–07
74	485–062–08
75	485–062–09
76	485–062–10
77	485–062–11
78	485–062–12
79	485–063–01
80	485–063–02
81	485–063–03
82	485–063–04
83	485–063–05
84	485–063–06
85	485–063–08
86	485–071–01
87	485–071–02
88	485–071–03
89	485–071–04
90	485–071–05
91	485–071–06
92	485–071–07
93	485–071–08
94	485–071–09
95	485–071–10
96	485–071–11
97	485–071–12
98	485–071–13
99	485–071–14
100	485–071–15
101	485–071–16
102	485–071–17
103	485–071–18
104	485–071–19
105	485–071–20
106	485–072–01
107	485–072–02
108	485–072–03
109	485–072–04
110	485–072–05
111	485–072–06
112	485–072–07
113	485–072–08
114	485–072–09
115	485–072–10
116	485–072–11
117	485–072–12
118	485–072–13
119	485–072–14
120	485–072–15
121	485–072–16
122	485–072–17
123	485–072–18
124	485–072–19
125	485–072–20
126	485–073–01
127	485–073–02
128	485–073–03
129	485–073–04
130	485–073–05
131	485–073–06
132	485–073–07
133	485–073–08
134	485–073–09
135	485–073–10
136	485–081–01
137	485–081–02
138	485–081–03
139	485–081–04
140	485–081–05
141	485–081–06
142	485–082–01
143	485–082–02
144	485–082–03
145	485–082–04
146	485–082–05
147	485–082–06
148	485–083–01
149	485–083–02
150	485–083–03
151	485–084–01
152	485–084–02
153	485–084–03
154	485–084–04
155	485–084–06
156	485–084–08
157	485–084–09
158	485–084–10
159	485–084–11
160	485–085–01
161	485–085–02
162	485–085–03
163	485–085–04
164	485–085–05
165	485–085–06
166	485–086–01
167	485–086–02
168	485–086–03
169	485–086–04
170	485–086–05
171	485–086–06
172	485–086–07
173	485–086–08
174	485–086–09
175	485–086–10
176	485–086–11
177	485–086–12
178	485–091–01
179	485–091–02
180	485–091–03
181	485–091–04
182	485–091–05
183	485–091–06
184	485–091–07
185	485–091–08
186	485–092–01
187	485–092–02
188	485–092–03
189	485–092–04
190	485–092–05
191	485–092–06
192	485–092–07
193	485–092–08
194	485–092–09
195	485–092–10
196	485–092–11
197	485–092–12
198	485–092–13
199	485–092–14
200	485–092–15
201	485–092–16
202	485–092–17
203	485–092–18
204	485–092–19
205	485–092–20
206	485–092–21
207	485–092–22
208	485–092–23
209	485–092–27
210	485–093–01
211	485–093–02
212	485–093–03
213	485–093–04
214	485–093–05
215	485–093–06
216	485–093–07
217	485–093–08
218	485–093–09
219	485–093–10
220	485–093–11
221	485–093–12
222	485–093–13
223	485–093–14
224	485–094–01
225	485–094–02
226	485–094–03
227	485–094–04
228	485–094–09
229	485–094–10
230	485–095–01
231	485–095–02
232	485–095–03
233	485–095–04
234	485–095–06
235	485–095–07
236	485–095–08
237	485–095–09
238	485–095–10
239	485–095–11
240	485–101–01
241	485–101–02
242	485–101–03
243	485–101–04
244	485–101–05
245	485–101–06
246	485–101–07
247	485–101–08
248	485–101–09
249	485–101–10
250	485–101–11
251	485–101–12
252	485–101–13
253	485–102–01
254	485–102–02
255	485–102–03
256	485–102–04
257	485–102–05
258	485–102–06
259	485–102–07
260	485–102–08
261	485–102–09
262	485–102–10
263	485–102–11
264	485–102–12
265	485–102–13
266	485–102–14
267	485–102–15
268	485–102–16
269	485–102–17
270	485–103–01
271	485–103–04
272	485–103–05
273	485–103–06
274	485–103–07
275	485–103–08
276	485–103–09
277	485–103–10
278	485–103–12
279	485–103–13
280	485–103–14
281	485–124–01
282	485–124–02
283	485–124–05
284	485–124–06
285	485–125–17
286	485–125–19
287	485–125–20
288	485–125–23
289	485–132–01
290	485–132–02
291	485–132–03
292	485–132–04
293	485–132–05
294	485–132–06
295	485–132–07
296	485–132–08
297	485–134–01
298	485–134–02
299	485–134–03
300	485–136–01
301	485–136–02
302	485–136–03
303	485–136–04
304	485–136–05
305	485–136–06
306	485–136–07
307	485–136–08
308	485–136–09
309	485–136–10
310	485–136–11
311	485–136–12
312	485–136–13
313	485–136–14
314	485–136–15
315	485–136–16
316	485–136–17
317	485–136–18
318	485–136–19
319	485–136–20
704	485–281–01
705	485–281–02
706	485–281–03
707	485–281–04
708	485–281–05
709	485–281–06
710	485–281–07
711	485–281–08
712	485–281–09
713	485–281–10
714	485–281–11
715	485–281–12
716	485–281–13
717	485–281–16
718	485–281–17
719	485–281–18
720	485–281–19
721	485–281–20
722	485–281–21
723	485–281–22
724	485–281–23
725	485–281–24
726	485–281–25
727	485–281–39
728	485–281–40
729	485–281–41
730	485–281–42
731	485–281–43
732	485–281–44
733	485–281–45
734	485–281–46
735	485–281–47
736	485–281–48
737	485–281–51
738	485–281–52
739	485–281–53
740	485–281–54
741	485–281–55
742	485–281–56
743	485–281–57
744	485–281–58
745	485–281–59
746	485–281–60
747	485–281–63
748	485–281–64
749	485–281–65
750	485–281–66
751	485–281–67
752	485–281–68
753	485–281–69
754	485–281–70

SHEET 3 OF 3

COUNTY SERVICE AREA 82 (SV4) TRONA SEWER SYSTEM

Prepared By: So & Associates Engineers, Inc. 04/13/9

S.B.C.F.C.D. EASEMENT

N

SCALE: 1" = 200'

LEGEND

- C.S.A. 82 BOUNDARY
- G–8 — MANHOLE (NUMBER, REFER TO MANHOLE SCHEDULE FOR RIM & INVERT ELEVATIONS)
- C.O. — CLEANOUT
- 268 — PARCEL ID No. (REFER TO PARCEL IDENTIFICATION SCHEDULE FOR A.P.N. No.)
- IMPROVED PARCEL
- 200' — 4–INCH SEWER & LENGTH
- 200' — 6–INCH SEWER & LENGTH
- 200' — 8–INCH SEWER & LENGTH
- 200' — 10–INCH SEWER & LENGTH
- 200' — 12–INCH SEWER & LENGTH

SEE SHEET 3

PARCEL IDENTIFICATION SCHEDULE

ID No.	A.P.N. No.
7	485–041–26
8	485–041–27
320	485–181–01
321	485–182–01
322	485–182–02
323	485–182–03
324	485–182–04
325	485–182–05
326	485–182–06
327	485–182–07
328	485–182–10
329	485–182–11
330	485–183–01
331	485–183–02
332	485–183–03
333	485–183–04
334	485–183–05
335	485–183–06
336	485–183–07
337	485–183–08
338	485–183–09
339	485–183–10
340	485–183–11
341	485–183–12
342	485–184–01
343	485–184–02
344	485–184–03
345	485–184–04
346	485–184–05
347	485–184–06
348	485–184–07
349	485–184–08
350	485–184–09
351	485–184–10
352	485–184–11
353	485–184–12
354	485–184–13
355	485–184–14
356	485–184–15
357	485–185–01
358	485–185–02
359	485–185–03
360	485–185–04
361	485–185–05
362	485–185–06
363	485–185–07
364	485–185–08
365	485–185–09
366	485–185–10
367	485–185–11
368	485–185–12
369	485–186–01
370	485–186–02
371	485–186–03
372	485–186–07
373	485–191–01
374	485–191–02
375	485–191–03
376	485–191–04
377	485–191–05
378	485–191–06
379	485–191–07
380	485–191–08
381	485–191–09
382	485–191–10
383	485–191–11
384	485–191–12
385	485–192–01
386	485–192–02
387	485–192–03
388	485–192–04
389	485–192–05
390	485–192–10
391	485–192–11
392	485–192–12
393	485–192–13
394	485–192–14
395	485–192–15
396	485–192–16
397	485–192–17
398	485–192–18
399	485–192–19
400	485–192–22
401	485–192–23
402	485–193–01
403	485–193–02
404	485–193–03
405	485–193–04
406	485–193–05
407	485–193–06
408	485–193–07
409	485–193–08
410	485–193–09
411	485–193–10
412	485–193–11
413	485–193–12
414	485–193–13
415	485–193–14
416	485–193–15
417	485–193–16
418	485–194–01
419	485–194–02
420	485–194–03
421	485–194–04
422	485–194–07
423	485–194–08
424	485–194–09
425	485–194–10
426	485–194–11
427	485–194–12
428	485–195–01
429	485–195–02
430	485–195–03
431	485–195–04
432	485–195–05
433	485–195–06
434	485–195–07
435	485–195–08
436	485–195–09
437	485–195–10
438	485–195–11
439	485–195–12
440	485–195–13
441	485–195–14
442	485–195–15
443	485–195–16
444	485–195–17
445	485–195–18
446	485–196–01
447	485–196–02
448	485–196–03
449	485–196–04
450	485–196–05
451	485–196–06
452	485–196–07
453	485–196–08
454	485–201–01
455	485–201–02
456	485–202–01
457	485–202–02
458	485–202–03
459	485–202–04
460	485–202–05
461	485–202–06
462	485–202–07
463	485–202–08
464	485–203–01
465	485–203–02
466	485–203–03
467	485–203–04
468	485–203–05
469	485–203–06
470	485–203–07
471	485–203–08
472	485–204–01
473	485–204–02
474	485–204–03
475	485–204–04
476	485–204–05
477	485–204–06
478	485–204–07
479	485–204–08
480	485–204–09
481	485–204–10
482	485–205–01
483	485–205–02
484	485–205–03
485	485–205–04
486	485–205–05
487	485–206–03
488	485–206–04
489	485–206–05
490	485–206–06
491	485–206–09
492	485–206–10
493	485–211–01
494	485–211–02
495	485–211–03
496	485–211–04
497	485–211–05
498	485–211–06
499	485–211–07
500	485–211–08
501	485–211–09
502	485–211–10
503	485–211–11
504	485–211–12
505	485–211–13
506	485–211–14
507	485–211–15
508	485–211–16
509	485–211–17
510	485–211–18
511	485–211–19
512	485–211–20
513	485–211–21
514	485–211–22
515	485–211–23
516	485–211–24
517	485–211–25
518	485–211–26
519	485–211–27
520	485–211–28
521	485–212–01
522	485–212–02
523	485–212–03
524	485–212–04
525	485–212–05
526	485–212–06
527	485–212–07
528	485–213–02
529	485–213–03
530	485–213–04
531	485–213–05
532	485–213–06
533	485–213–07
534	485–213–08
535	485–213–09
536	485–213–10
537	485–213–11
538	485–213–12
539	485–213–13
540	485–213–14
541	485–213–15
542	485–213–16
543	485–213–17
544	485–213–18
545	485–213–19
546	485–213–20
547	485–213–21
548	485–213–22
549	485–213–23
550	485–213–25
551	485–213–26
552	485–214–01
553	485–214–02
554	485–214–03
555	485–214–04
556	485–214–05
557	485–214–06
558	485–214–07
559	485–214–08
560	485–214–09
561	485–214–10
562	485–214–11
563	485–214–12
564	485–214–13
565	485–214–14
566	485–214–15
567	485–214–16
568	485–214–17
569	485–214–18
570	485–214–19
571	485–214–20
572	485–214–21
573	485–214–22
574	485–214–23
575	485–214–24
576	485–214–25
577	485–214–26
578	485–214–27
579	485–214–28
580	485–221–01
581	485–221–02
582	485–221–03
583	485–221–04
584	485–221–05
585	485–221–06
586	485–221–07
587	485–221–08
588	485–221–11
589	485–221–12
590	485–221–13
591	485–222–01
592	485–222–02
593	485–222–03
594	485–222–04
595	485–222–05
596	485–222–06
597	485–222–07
598	485–222–08
599	485–222–09
600	485–222–10
601	485–222–11
602	485–223–03
603	485–224–01
604	485–225–01
605	485–225–02
606	485–225–03
607	485–225–04
608	485–225–05
609	485–225–06
610	485–225–07
611	485–231–01
612	485–232–01
613	485–232–02
614	485–232–03
615	485–232–04
616	485–232–05
617	485–232–06
618	485–232–07
619	485–232–08
620	485–232–09
621	485–232–10
622	485–232–11
623	485–232–12
624	485–233–01
625	485–233–02
626	485–233–03
627	485–233–04
628	485–233–05
629	485–233–06
630	485–233–07
631	485–233–08
632	485–233–09
633	485–233–10
634	485–233–11
635	485–233–12
636	485–233–13
637	485–233–14
638	485–233–15
639	485–233–16
640	485–233–17
641	485–233–18
642	485–233–19
643	485–233–20
644	485–233–21
645	485–234–01
646	485–234–02
647	485–234–03
648	485–234–04
649	485–234–05
650	485–234–06
651	485–234–07
652	485–234–08
653	485–241–02
654	485–241–03
655	485–241–04
656	485–241–12
657	485–241–13
658	485–242–01
659	485–242–02
660	485–242–03
661	485–243–01
662	485–243–02
663	485–243–03
664	485–243–04
665	485–251–01
666	485–251–02
667	485–251–03
668	485–251–04
669	485–251–05
670	485–251–06
671	485–251–07
672	485–251–08
673	485–251–09
674	485–251–10
675	485–251–11
676	485–251–12
677	485–251–13
678	485–251–14
679	485–251–15
680	485–252–01
681	485–252–02
682	485–252–03
683	485–252–04
684	485–252–05
685	485–252–06
686	485–252–07
687	485–252–08
688	485–261–02
689	485–261–03
690	485–262–03
691	485–262–04
692	485–262–05
693	485–262–06
694	485–262–07
695	485–262–08
696	485–262–09
697	485–262–10
698	485–262–11
699	485–262–12
700	485–262–13
701	485–262–14
702	485–262–15
703	485–262–16

MANHOLE SCHEDULE

M.H. No.	RIM ELEV.	INVERT ELEV.
2	1644.43	1637.13
3	1644.90	1636.20
4	1641.10	1634.90
5	1639.65	1633.45
6	1637.79	1632.09
9	1640.37	1629.97
10	1639.62	1630.51
11	1639.53	1631.53
12	1640.19	1632.54
12A	1640.21	1632.71
13	1638.52	1632.72
14	1643.15	1634.05
15	1644.40	1636.10
16	1646.30	1637.40
17	1648.17	1638.67
18	1647.72	1639.92
19	1648.08	1641.28
20	1648.38	1642.58
21	1648.33	1642.93
22	1633.54	1629.84
A–1	1685.05	1679.45
A–2	1676.00	1669.80 E.&S. 1672.94 W.
A–3	1669.26	1665.96
A–4	1664.89	1661.39
A–5	1660.76	1658.16
A–6	1660.35	1657.65
A–7	1660.83	1655.13
B–1	1678.57	1673.22
B–2	1681.76	1676.51
C–1	1667.83	1664.08
C–2	1664.73	1660.28
C–3	1661.60	1657.85
C–4	1656.98	1652.23
C–5	1651.55	1647.95 W. 1645.90 E.
D–1	1676.40	1672.72
D–2	1672.64	1669.29
D–3	1668.43	1665.43
D–4	1667.85	1664.65
D–5	1665.13	1661.93
D–6	1664.13	1661.48 S. 1660.93 N.&W.
E–1	1684.17	1680.47
E–2	1684.64	1680.14
E–3	1680.02	1675.62
E–4	1673.79	1669.64
E–5	1669.98	1665.28
E–6	1669.66	1665.36
E–7	1665.31	1660.91
E–8	1657.41	1653.21
E–8A	1654.38	1649.93
E–9	1650.20	1645.75
F–1	1680.71	1679.06
F–2	1679.48	1675.53
F–3	1674.32	1670.42
F–4	1670.41	1666.01
F–4A	1665.74	1660.29
F–5	1660.29	1656.61
F–6A	1648.20	1646.00
F–7	1647.67	1645.24
G–1	1682.22	1677.43
G–2	1677.82	1674.97
G–3	1673.34	1669.74
G–4	1671.46	1668.34
G–5	1667.38	1663.78
G–6	1662.29	1659.19
G–7	1657.37	1654.27
G–8	1650.68	1646.88

M.H. No.	RIM ELEV.	INVERT ELEV.
H–1	1681.74	1678.44
H–2	1677.56	1674.06
H–3	1674.31	1672.41
H–3A	1674.60	1671.00
H–4	1668.12	1665.17
H–5	1661.08	1658.98
H–6	1655.78	1652.78
H–7	1652.50	1649.90
H–7A		
I–1	1668.42	1664.92
I–2	1665.32	1661.92
I–2A	1660.06	1656.96
I–3	1655.03	1651.58
I–4	1651.49	1648.04
I–5		
J–1	1662.38	1657.38
J–2	1654.29	1650.39
J–3	1649.64	1645.59
J–4	1646.53	1642.03
K–1		
K–2	1652.25	1648.80
K–3	1646.70	1643.02
L–1	1661.41	1658.54
L–2	1658.61	1654.36
L–3	1651.25	1644.60
L–4	1651.60	1645.05
M–1	1656.93	1653.25
M–2	1656.28	1652.28
M–3	1652.23	1648.01
M–4	1647.53	1644.68
M–5	1645.98	1644.15
M–6	1644.61	1641.56
M–6A	1642.65	1639.45
M–6B	1646.34	1642.89
M–7	1649.69	1647.27
M–8	1644.64	1642.39
N–1	1657.46	1653.76
N–2	1654.23	1651.93
N–2A	1651.44	1648.24
N–3	1649.92	1647.72
N–4	1645.42	1638.47
O–1	1647.96	1644.51
O–2	1646.36	1643.16
O–3	1645.95	1642.88
O–4	1646.28	1642.52
O–5	1650.02	1646.84
O–6	1647.51	1644.76
O–7	1643.99	1641.17
P–1	1651.89	1647.81
P–2	1650.71	1647.41
P–3	1646.75	1643.65
P–4	1646.75	1642.95
P–5	1637.99	1634.27
P–6	1639.01	1630.91

C.S.A. 82 (SV3) BOUNDARY

EFFLUENT LINE FROM PIONEER POINT

SEPTIC TANK

COUNTY SERVICE AREA 82 (SV3)
TRONA SEWER SYSTEM

Prepared By: So & Associates Engineers, Inc. 04/13/9

NOT FOR BID

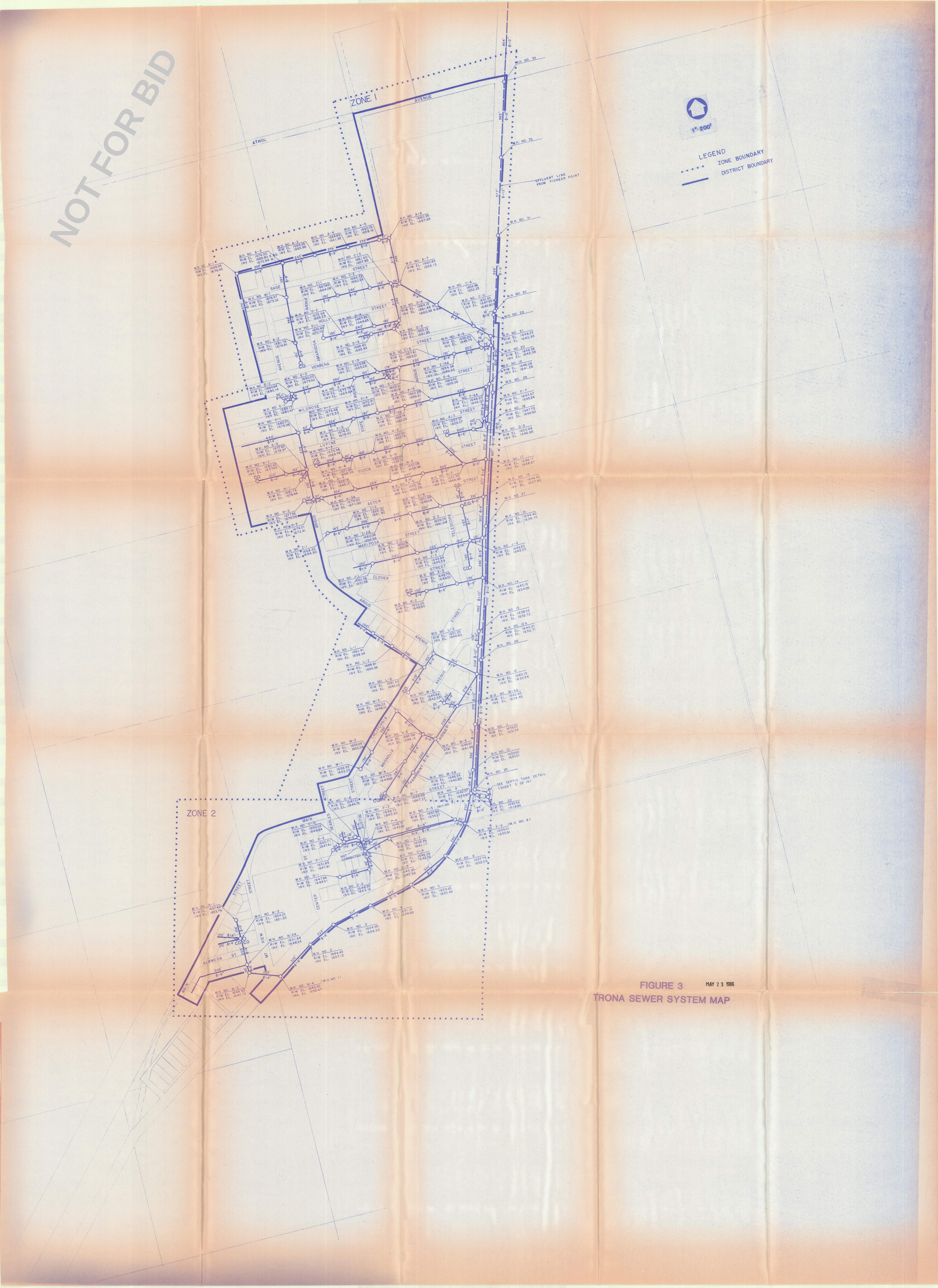


FIGURE 3

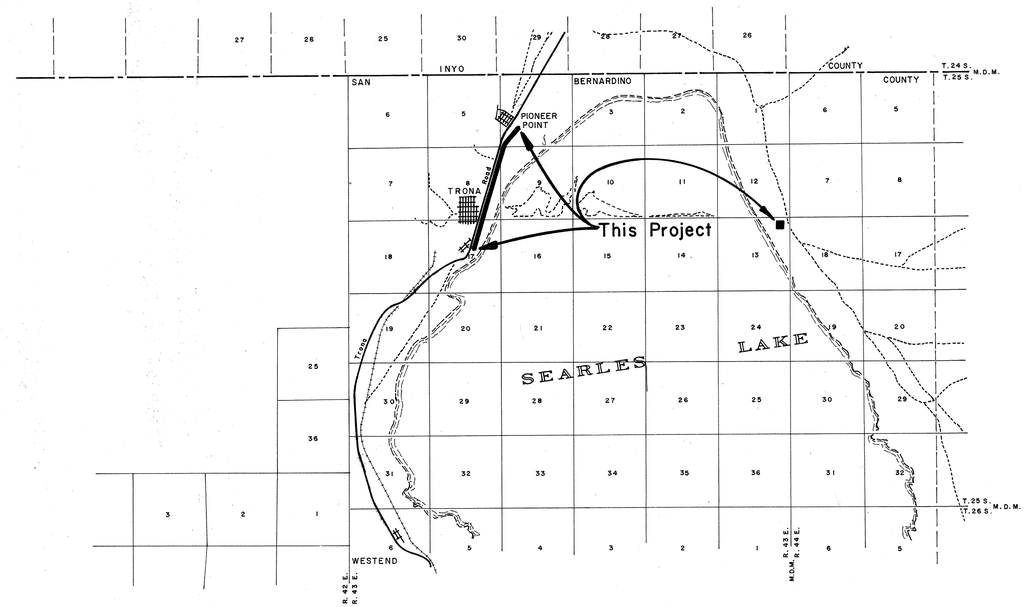
TRONA SEWER SYSTEM MAP

MAY 23 1986

COUNTY OF SAN BERNARDINO

COUNTY SERVICE AREA 82

SEARLES VALLEY
WASTEWATER FACILITIES



SWRCB PROJECT NO. C-06-1274

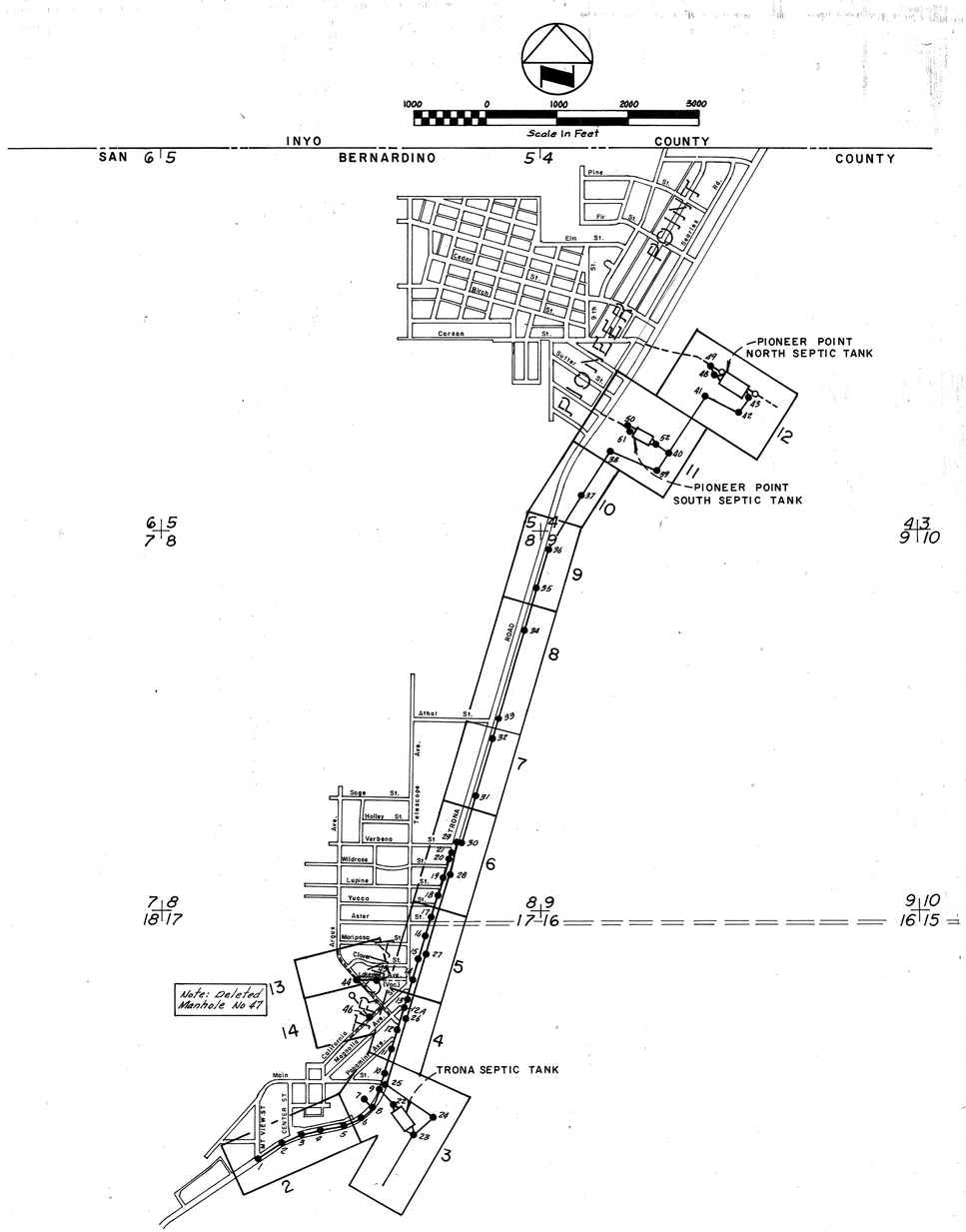
PREPARED BY

CM ENGINEERING ASSOCIATES

INDEX OF SHEETS

05-78-01 7672

NOT FOR BID



○ EXISTING MANHOLE

● PROPOSED MANHOLE

△ REVISED TO "AS BUILT" CONDITIONS
Date 11-18-80

Revision	No.	By	Date	Appr.
Revised to "As Built" Conditions	△	W.S	11-18-80	R.F.

Submitted By:
John R. Dalke — 2/23/79
R.C.E. No. 27,485 — Date

Designed E.Shaw & P.Leja. Checked J.R.D.
Drawn L.R.M. Job No. 05-78-01

ENGINEERING ASSOCIATES
Mail P. O. Box 6087 · 92412
Phone (714) 884-8804 or (714) 825-9562
225 East Airport Drive, San Bernardino, California

COUNTY OF SAN BERNARDINO
COUNTY SERVICE AREA 82
WASTEWATER FACILITIES

SEARLES VALLEY
INDEX MAP
Sheet 1 of 19 Sheets
Dwg. No.

5-78-01(22)

Revision	No.	By	Date	Appr.
Revised to "As Built" Conditions	△	W.S.	11-18-80	R.F.

Submitted By: R.C.E. No. 27,485 — Date 2/23/77

Designed E. Shaw & P. Leja — Checked J.R.D.

Drawn L.R.M. — Job No. 05-78-01

CM ENGINEERING ASSOCIATES
Mail P. O. Box 6087 · 92412
Phone (714) 884-8804 or (714) 825-9562
225 East Airport Drive, San Bernardino, California

COUNTY OF SAN BERNARDINO
COUNTY SERVICE AREA 82
WASTEWATER FACILITIES

SEARLES VALLEY
TRONA ROAD
GRAVITY SEWER – MH No 1 To MH No 5

Sheet 2 of 19 Sheets
Dwg. No.

5-78-01(272)

Revision	No.	By	Date	Appr.
Revised to "As Built" Conditions	△	W.S.	11-18-80	R.F.

Submitted By: R.C.E. No. 27,485 — 2/23/79 Date

Designed: E. Shaw & P. Leja — Checked: J.R.D.

Drawn: L.R.M. — Job No. 05-78-01

C M ENGINEERING ASSOCIATES
Mail P.O. Box 6087 · 92412
Phone (714) 884-8804 or (714) 825-9562
225 East Airport Drive, San Bernardino, California

COUNTY OF SAN BERNARDINO
COUNTY SERVICE AREA 82
WASTEWATER FACILITIES

SEARLES VALLEY
TRONA ROAD
GRAVITY SEWER - MH No 5 To MH No 10
OUTFALL SEWER - STA 33 To OUTLET

Sheet 3 of 19 Sheets
Dwg. No.