US Army Corps of Engineers
Los Angeles District

Santa Cruz River, Paseo de las Iglesias
Pima County, Arizona

Draft Feasibility Report

APPENDIX F

GEOTECHNICAL

July 2004

U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT
PLANNING DIVISION, WATER RESOURCES BRANCH
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

APPENDIX F
GEOTECHNICAL EVALUATION
FEASIBILITY REPORT
FOR
PASEO DE LAS IGLESIAS, FEASIBILITY STUDY
PIMA COUNTY, ARIZONA

CONTENTS

1.0 STUDY OBJECTIVE

The objective of the Paseo de las Iglesias Feasibility Study is to evaluate environmental restoration alternatives along the Santa Cruz in eastern Pima County. The appendix presents an evaluation performed by the U.S. Army Corps of Engineers, Los Angeles District Geotechnical Branch to assess general geotechnical issues, including HTRW that may impact the array of final alternatives under consideration. This evaluation is based on data and information provided by the non-Federal Sponsor and the final array of alternatives (and measures) that were developed during plan formulation to provide a basis design leading to the development of the construction plans and specifications.

2.0 STUDY AREA

The Paseo de las Iglesias study area is located in eastern Pima County, Arizona. The study area extends along the Santa Cruz River between Congress Street (downstream limit) to Los Reales Road (upstream limit) for a total length of approximately 7.5 miles. The study area varies from 0.5 miles to 1.6 miles wide and encompasses approximately 5005 acres.

3.0 SOURCES OF INFORMATION

Sources if information used in this geotechnical evaluation included:

- *Paseo de las Iglesias Draft Feasibility Report*, May 2004.
- *Paseo de las Iglesias F-3 Geotechnical Appendix*, February 27, 2002, by LMT Engineering, Inc. dated 27 February 2002 (under contract for Pima County Flood Control District).
- *Appendix G, Phase I Environmental Site Assessment for Paseo de las Iglesias Feasibility Report,* September 24, 2002, by SWCA, Inc. Environmental Consultants.

The final array consisted of the fourteen (14) of alternatives were obtained from Chapters 5 and 6 of the Draft Feasibility Report and are identified below:

Table 1: Alternative Names

Screening	Alternative Name	Screening	Alternative Name
NMX	1A	MMM	3E
NMM	1B	HNN	4A
XXX	2A	HXN	4B
MXN	3A	HXX	4C
MXX	3B	HHN	4D
MMN	3C	HHX	4E
MMX	3D	HHM	4F

The letter designations refer to what will be done within the active low flow channel (first letter), the terraces (second letter), and the over bank historic floodplain (third letter). "H" stands for "hydroriparian", which will carry the greatest water requirements; "M" stands for "mesoriprarian", which connotes lesser water requirements; "X" stands for "xeroriprarian", which connotes still less water requirements, and "N" stands for "none" (for example, in alternative HNN, there are no water requirements for either the terrace, or the floodplain).

4.0 POTENTIAL ISSUES

4.1 Slope Stability. The issue of slope stability will needs to be addressed, particularly for the sand and gravel pits at the southern end of the project area, for all of the alternatives that include floodplain restoration encompassing the large areas described in the Phase I Environmental Site Assessment (ESA) as being a sand and gravel mine, or as implied as such on the topographic map in the Phase I ESA (p. 8). These alternatives are 1A, 1B, 2A, 3B, 3D, 3E, 4B, 4C, 4D, 4E, and 4F.

Alternatives from the list above that include the maintaining a perennial channel and / or a hydroriparian zone deserve the most attention, since, presumably, the most water would be added to the system to maintain these features. Those alternatives include 4A, 4B, 4C, 4D, 4E, and 4F.

The lake adjoining Interstate 19 is related to the sand and gravel mining operation. Most of the alternatives show at least some part of that lake continuing to exist into the development of a restoration project as an off-channel basin, and also, the existence of several new off-channel basins. In alternatives where off-channel basins are to exist or be constructed, the potential issue of slope stability of the sand and gravel pit is even more important, as the stability may be affected by water saturation. These alternatives are 1A, 2A, 3B, 3D, 4C, and 4E.

For all of the mentioned alternatives, slope stability considerations will need to be addressed. A slope stability analysis for the sand and gravel site will be conducted during the Pre-Construction Engineering and Design Phase. In addition to in-channel erosion, non-structurally stabilized earthen slopes used for restoration could experience localized erosion, rilling, and head cutting caused by over bank runoff, therefore the slope stability analysis should included these areas as well.

4.2 Groundwater. In most alternatives, groundwater elevation may be raised, at least locally. In some alternatives, aquitards or water harvesting basins are included. Where no basins will be constructed, the mechanism of maintaining groundwater elevation increases is not apparent, therefore it is surmised that some local areas of perched groundwater will experience an increase in elevation. The groundwater data presented in the F-3 Geotechnical Appendix, plus other data that may be available, should be assessed further to look for trends in the perched groundwater areas, including locations, depths and directions of flow. At least some of this information could be obtained from EDR. Specifically, how much will each element of each alternatives feature cause the groundwater elevation to increase, and over what areas? A map of these results should then be developed. Once this area of impact is known, the issue regarding the relationship between the final alternative, groundwater, and landfills can be addressed. Where groundwater

level is to be increased in the vicinity of any of the seven landfills in or near the study area, the question of whether or not the projected new groundwater elevation will inundate any part of any of the existing landfills can be addressed. State and or other applicable criteria for such a situation should also be ascertained.

Because the Phase I Environmental Site Assessment summarizes the landfills in this manner (see Table 2 below), it would appear that inundation of the bottom of the landfill from rising groundwater elevations, including that of perched groundwater areas, will be a main issue. The anticipated impacts or lack thereof should be documented in one of the study reports, preferably the main report and a supplement to the geotechnical appendix.

Table 2: Landfill Data

Landfill Name	Cap? / Liner?	Depth of landfill (ft) / Quantity landfilled	Methane? / VOCs?	Ground-water contamination?	Remediation Status
Congress (part of Rio Nuevo South)	No report	10-35 / 384,000 yds^3	No data / yes (soil gas)	No	Slated for in-situ aerobic degradation to reduce methane, then redevelopment by City. Note: "on west river bank"
Nearmont (part of Rio Nuevo South)	No report	15-40 / 264,000 yds^3	Yes (high levels) / yes (soil gas)	No	Slated for in-situ aerobic degradation to reduce methane, then redevelopment by City. Note: "on west river bank"
"A" Mountain (part of Rio Nuevo South)	No report	15-50 / 2,000,000 yds^3	Yes (high levels) / yes (soil gas)	No	Slated for in-situ aerobic degradation to reduce methane, then redevelopment by City.
Mission	No report	10 / 32,872 tons	No (very limited testing) / no report	No report	Possibly NO HOUSEHOLD WASTE, only green waste , newspaper, and construction debris. Has been landscaped, drainage installed; incorp. into Santa Cruz River Park (Pima Co.). Apparently adjoins west river bank
29^{th} St.	No / no	50 ?? / 41,090 tons	Yes (and venting system at southern end where more trash was dumped) / yes (trace, soil gas)	No report	Extends N. to confluence of West Fork, Santa Cruz R. and mainstem, Santa Cruz R. Debris unearthed during soil cement bank stabilization. Gasses thought to be rapidly dissipating through soil from center of deposit and little gas accumulation on perimeters.
Ryland	No / no	50 ?? / 365,250 tons	No report but methane and leachate apparently are suspected	No report	Adjoins east river bank or Julian Wash bank. Debris unearthed during flooding. City, as of 2001, plans to excavate, repair, install drainage, remove any trash encountered during this work
Cottonwood	Yes (good condition)	unknown / no tabulated	Yes (can be high);	No (unrelated	Residences and drinking water supply well on site

Landfill Name	Cap? / Liner?	Depth of landfill (ft) / Quantity landfilled	Methane? / VOCs?	Ground-water contamination?	Remediation Status
			extraction system was in place / no report	coliform bacteria and nitrate)	
Barnett & Shore	No report	No report	No report	No report	Possibly contains only brick and concrete and, if so, is a non-issue

A different subject, but still under the topic of groundwater issues, is the Tucson International Airport (TIA) Trichloroethylene (TCE) environmental site. Some research needs to be done regarding what the groundwater elevation manipulations of the study will or will not do to impact the TIA site, at which contaminants are groundwater-borne. The site borders the study area at the location where the greatest concentrations of off-channel basins will be, thus it is at the locations where the study features presumably could impact groundwater levels the most. Potential impacts will need to be addressed assessed during the design phase.

4.3 Landfills. In addition to the groundwater / landfill inundation issue addressed above under Section 4.2, there is the prospect of encountering landfill materials during construction or project excavation. A system of identifying the possible encountered materials and a plan for dealing with each type should be developed. Rather than non-specific "dot on the map" method of identifying the landfill locations, which is what has been presented to date, an effort should be made to show the full landfill perimeter, as known or as suspected. This will be a guide to the areas in which landfill materials may be encountered.

Regarding what might be encountered, the sum total of the reports reviewed to date suggests a rather benign set of candidates including but not limited to: green materials, construction debris, tires, and household trash. Tires may be one of the worst contaminants, but usually are rather intact and highly recognizable, so they should be relatively easy to segregate, when encountered. Household trash might be somewhat of a problem due to unknown contents. Green materials and construction debris likely can just be shipped to facilities that take similar materials now. But a plan needs to be developed and presented for review that addresses what is to be done with each expected debris type. Estimates of quantities should be developed for costing purposes. The importance of showing the true boundaries, rather than map dots, becomes more important. Without such boundaries, some cost estimates could be made.

4.4 Other HTRW Concerns. As shown in the previously supplied examples of Corps work on HTRW, a complete listing of RCRIS sites, HAZMAT sites, and USTs that are in or adjoining the potential construction reaches needs to be tabulated and made available to the construction team. After examining the Phase I ESA and the raw EDR data, it appears this list will be a short one. A preliminary review suggests the list will include the Honeywell and Pima school sites at Drexel, the Chevron and Conoco sites (for USTs) at Ajo Way, and other UST sites numbered 4/6, 9, 19, 20, 23, 28 on the EDR list. The "unlocatable" EDR UST site, a Chevron at 1285 W. Ajo Way appears to the same site as the Chevron mentioned by the Phase I ESA as "not on the EDR listing", but there was no address mentioned in the ESA citing, so this needs to be verified.

A check should also be made to see if the "unlocatable" EDR listing for "Your Cleaners", at the intersection of Valencia and Midvale Park, does on site dry cleaning. If not, this site may be a non-issue.

5.0 RECOMMENDED PLAN

He recommended plan as identified in Draft Feasibility Report and Environmental Impact Statement is Alternative 3E. Based on the issues identified herein, the following summarizes recommendations for Alternative 3E:

- Slope stability issues, particularly at the sand and gravel site(s) warrant additional analysis during the PED Phase. The same applies to new earthen slopes created for habitat restoration that could experience localized erosion, rilling, and head cutting caused by over bank runoff.
- The groundwater data collected to date, plus other new data that may become available, should be assessed further to look for trends in the perched groundwater areas, including locations, depths and directions of flow. Specifically, how much will each element of each alternatives feature cause the groundwater elevation to increase, and over what areas? A map of these results should then be developed.
- Where groundwater level is to be increased in the vicinity of any of the seven landfills in or near the study area, the question of whether or not the projected new groundwater elevation will inundate any part of any of the existing landfills can be addressed. State and or other applicable criteria for such a situation should also be ascertained.
- Some research needs to be done regarding what the groundwater elevation manipulations of the study will or will not do to impact the TIA site, at which contaminants are groundwater-borne. The site borders the study area at the location where the greatest concentrations of off-channel basins will be, thus it is at the locations where the study features presumably will impact groundwater levels the most. Potential impacts need to be addressed.
- An effort should be made to show the full landfill perimeter(s), as known or as suspected. This will be a guide to the areas in which landfill materials may be encountered during excavation.
- Estimates of quantities of potential landfill materials should be developed for costing purposes.
- A complete listing of RCRIS sites, HAZMAT sites, and USTs that are in or adjoining the potential construction reaches needs to be tabulated and made available to the design and construction team(s).

The above recommendations are not intended to be a comprehensive list. Additional recommendations and data collection may be required based on refinement of the final recommended plan into the design and construction phases.

LMT ENGINEERING, INC.

Geotechnical & Materials Engineering

180 S. Chelsea Park Place
Tucson, Arizona 85748-1720
Tel: 520/885.3344
Fax: 520/885.8218
www.lmtengineering.com
info@lmtengineering.com

February 27, 2002

Mr. Thomas J. Helfrich
Chief Hydrologist
Pima County Floodplain Management Division
201 N. Stone Ave., 4th Floor
Tucson, AZ 85701-1207

Re: Paseo de las Iglesias Environmental Restoration Study
Santa Cruz River, Congress to Los Reales
Pima County, Arizona
Pima County WO#: 4FPDLI
LMT Project No. 21563

Attached is our report for the referenced study. This report presents the results of our soils, materials and geologic investigations to verify feasibility of alternative solutions for erosion control and bank stabilization along the Santa Cruz River. The study area extends along both sides of the Santa Cruz River from Congress Street on the north to Los Reales Road on the south. The report was prepared in collaboration with Robert L. Sogge, P.E., Ph.D.

This report is the initial phase of the scope of the study to evaluate alternative methods of erosion prevention/control for the Santa Cruz.

If you have any questions or comments about the report, please contact us.

Sincerely,
LMT Engineering, Inc.

Lyle M. Tweet, P.E.
President

R L Sogge

Robert L. Sogge, P.E., Ph.D.
Consultant

Dist: Addressee (6)

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1. INTRODUCTION

PURPOSE AND SCOPE

1.1. This report presents the results of the initial phase of our geologic, soils, and materials evaluation for the Paseo de las Iglesias study. Our services evaluated the existing bed and bank conditions and the types and physical properties of the materials in the bed and banks of the Santa Cruz River and West Branch of the Santa Cruz. In addition, we researched information relating to the geologic and seismic conditions of the area, groundwater conditions, and landfill conditions along the designated stretch of the Santa Cruz River and West Branch in order to provide information to evaluate potential methods of stabilizing the banks along the study alignment.

This report describes the geologic and seismic setting, the field and laboratory tests performed and their results, the results of field studies, the extent and type of trash and debris that were identified and our opinions regarding use of the native soils for construction of soil-cement bank protection.

SITE LOCATION AND DESCRIPTION

1.2. The proposed Paseo de las Iglesias Environmental Restoration Study is located along two northward flowing branches of the Santa Cruz River extending from the central downtown area, specifically Congress St., directly south seven miles to its southern extent at Los Reales Rd in the Tucson, Arizona, metropolitan area in central Pima County. This area is the cradle of modern day Tucson and has a lineage of continued inhabitance dating back to settlement by the Spanish missionaries. San Xavier Mission was developed near the southern extent of the study and a convent was established near the northern end of the study, thus the name “Paseo de las Iglesias”, or “passage between the churches.”

1.3. The main channel of the Santa Cruz River flows in a relatively straight northerly direction from the south to the north ends of the study area. The West Branch of the Santa Cruz River currently extends from the southern border of the study north approximately 3.5 miles to where it flows into the main Santa Cruz River just north of Irvington Road. The portion of this channel just north of Irvington Road has been re-routed. The former channel (before it was re-routed) extends from just north of Irvington to just south of 22nd St. where it joins the main branch of the Santa Cruz River. The Site Plan accompanying this report displays these channels and the general location of the study. The area between the two branches of the Santa Cruz encompasses a relatively flat, alluvial plain. Over much of the study length, a highly urbanized area abuts both sides

of the river. In these regions many of its bank sections have been stabilized with soil cement (reference photos 6 through 12 in Appendix A of this report). (Note that the photos in Appendix A are for this study. The “Landfills and Waste Disposal Sites along the Santa Cruz River from Grant Road to Pima Mine Road” report by the Pima Association of Governments in Appendix E of this report also has photos which have the same numbers. Photo references in the body of this report relate tothe photos in Appendix A.)

STUDY DESCRIPTION

1.4 Improvements proposed for the river consist of an environmental restoration of the river and its surrounding overbanks consistent with the population and development extant in the study domain. Alternative restoration types may consist of different types of bank protection having varying levels of resistance to erosion and varying locations within the overbank areas as well as invert stabilizers or grade-control structures.

2. GEOLOGY

TOPOGRAPHY

2.1 The study area is located near the central portion of the Tucson basin, a broad 1,000 sq mi valley in the Santa Cruz River drainage basin. The topography of this basin is typical of the Basin and Range Physiographic Province. Northwestward trending, steep, rugged fault block mountains border the broad, gently northwestward sloping alluvium-filled valley. The basin is about 50 miles long and is approximately 20 miles wide in the southern and central parts, narrowing to 4 miles wide at the northwest outlet. The basin is bounded on the north and east by the Tortolita, Santa Catalina, Tanque Verde, Rincon, Empire and Santa Rita Mountains, and on the west by the Tucson, Black and Sierrita Mountains. The mountains on the west side of the basin range from 3000 to 6000 ft elevation, and those on the north and east side have elevations generally ranging from 6000 to 8000 ft, with peaks rising to elevations of 9400 ft. The metropolitan City of Tucson resides at the approximate center of this basin at an elevation of about 2400 ft. The Santa Cruz River channel extends north from Mexico into the south-central portion of this basin and exits north of the basin where it eventually terminates into the Gila River. Flow occurs in the channel during most of the year south of the Tucson Basin. The flow during dry times of the year is a result of discharges from the Nogales, Arizona, and Nogales, Sonora, Mexico, sewage treatment plants. During dry times of the year, such flow does not normally extend further north than Green Valley, Arizona, approximately 15 to 20 miles south of the study area.

Along the extent of this study area, sixteen tributaries flow into the main Santa Cruz River (including the South Channel), historic and diverted West Branch(es) of the Santa Cruz, Tucson Diversion Channel, and many others. The main channel, west branch(es) and all of these tributaries are ephemeral and generally only flow in direct response to rainfall and/or snow melt in the region and nearby mountains.

REGIONAL GEOLOGY

2.2 The complex geological history of Arizona has resulted in the formation of three geologic physiographical provinces. The three provinces consist of the Colorado Plateau (in the northern area of the state), the Basin and Range Province (encompassing southern and western Arizona), and the Central Highlands or Transitional Zone (encompassing the central part of the state). The Santa Cruz River Watershed lies within the Sonoran Desert of the Basin and Range Physiographic Province. The north to northwest trending alluvial basin is characterized by a semi-arid to arid broad valley.

The Santa Cruz River Basin is paralleled by steep mountain ranges composed of igneous, metamorphic, and sedimentary rocks of Precambrian (over 600 million years old) to Tertiary (63 to 2 million years ago) age. (Anderson 1987) The mountains lie upon a Precambrian igneous and metamorphic basement complex that is composed predominantly of granite and diorite, schist and gneiss, and volcanics.

The present relief of the Santa Cruz River Basin is a direct result of a period of regional uplifting due to block faulting that took place during the late Tertiary (63 to 2 million years ago) or early Quaternary (2 million years ago to present). Concurrent with the uplifting of the regional mountains, large amounts of alluvium from the surrounding mountains have been deposited within the basin (at the center of the Santa Cruz River basin, bedrock is currently buried by more than 11,000 feet of alluvial sediments). The Tucson basin, a structural depression, is filled primarily with unconsolidated to indurated Tertiary and Quaternary age sedimentary deposits, with lesser amounts of intercalated evaporites and volcanic rocks.

The alluvial sediments deposited within the basin have been divided into four geologic units that are, in descending order of depth: surficial or recent alluvial deposits, the Fort Lowell Formation, the Tinaja Beds, and the Pantano Formation (ADWR 1996). The extent of these layers in the study area is shown in Table 9 in this section of the report. The surficial deposits occupy the streambed channels and are generally less than 100 feet thick. The coarse surficial deposits allow the infiltration of surface water to recharge the underlying units. The Fort Lowell Formation underlies the recent alluvial deposits and consists of unconsolidated to moderately consolidated sands and silts 300

to 400 feet thick throughout most of the basin (AMA 1998). The Tinaja Beds lie under the Fort Lowell Formation and are composed of sandstones and conglomerates with a total thickness of up to 5,000 feet at the center of the basin (AMA 1998). The Pantano Formation, which underlies the Tinaja Beds, is up to 6,400 feet thick near Davidson Canyon, which is about 20 miles southeast of Tucson along I-10. This formation consists of consolidated sandstones, conglomerates and mudstones. In addition to these sediments, as a result of intermittent periods of volcanism, there are areas of extrusive igneous rocks interbedded within the valley alluvium layers. Below the alluvial units and beds of volcanic rock, there is an impermeable basement complex, which extends to the surrounding mountainsides.

Table 9 - Stratigraphic Sediment Layers (from Well Logs) *

At Marana	
Fort Lowell Formation and Recent Alluvium	73 m-thick (240 ft) layer
Upper Tinaja Beds	73 m-thick (240 ft) layer
Volcanic Bedrock	Top at - 146 m (-480 ft)
Near Grant Road Crossing	
Fort Lowell Formation and Recent Alluvium	24 m-thick (80 ft) layer
Upper Tinaja Beds	73 m-thick (240 ft) layer
Middle Tinaja Beds	49 m-thick (160 ft) layer
Volcanic Bedrock	Top at - 146 m (-480 ft)
½ Mile South of I-19/I-10 Interchange	
Fort Lowell Formation and Recent Alluvium	46 m-thick (150 ft) layer
Upper Tinaja Beds	46 m-thick (150 ft) layer
Volcanic Bedrock	Top at - 91 m (-300 ft)
1.5 Miles South of San Xavier Mission	
Fort Lowell Formation and Recent Alluvium	49 m-thick (160 ft) layer
Upper Tinaja Beds	37 m-thick (120 ft) layer
Lower Tinaja Beds	24 m, minimum (80 ft)
1.5 Miles North of Sahuarita/I-19 Interchange	
Fort Lowell Formation and Recent Alluvium	52 m-thick (170 ft) layer
Upper Tinaja Beds	43 m-thick (140 ft) layer
Lower Tinaja Beds	195 m, minimum (640 ft)
1 Mile North of Green Valley	
Fort Lowell Formation and Recent Alluvium	73 m-thick (240 ft) layer
Upper Tinaja Beds	37 m-thick (120 ft) layer
Lower Tinaja Beds	180 m, minimum (600 ft)

* logs adapted from Anderson 1987

Poorly developed drainage systems gave rise to numerous pluvial lakes during the middle Tertiary, which accounted for rapid sediment filling of the basins. During the

Pleistocene (2 million to 10,000 years ago) drainage was established westward by the Gila River and its tributaries (including the Santa Cruz River). During high erosion and deposition periods, the Santa Cruz River basin floor developed numerous bajadas (smooth slopes originating at the base of the mountains) which extended outward into the Santa Cruz River channel. In more recent geologic time, during the Quaternary Period (present to 2 million years ago), climatic changes and regional uplift accelerated erosion, resulting in the upper bajada slopes being deeply dissected by lateral washes, causing development of terraces along the main drainage systems including the Santa Cruz River Basin.

The Santa Cruz River main channel through Tucson flows on the far west side of the Basin over the relatively thin, peripheral parts of the basin fill sediments. Typical sections, derived from well logs identify specific stratigraphic sediment layers underlying the Santa Cruz River.

SITE GEOLOGY

2.3 The alluvial deposits in the study area consist mainly of recent stream channel and floodplain deposits. These alluvial basin sediments are generally gravel and gravelly sand. Locally, the sediments in the study area are sand to sandy silt of fluvial origin. Lithified sediments do not crop out along the Santa Cruz River and generally they should not be present within excavation depths of the channel for structure installation, though such formations do approach the riverbed elevation in the vicinity of 22nd Street. The nearest rock exposures, classified as the Pantano Formation, occur in the foothills of the Santa Catalina Mountains to the north and east of the study. Rocks of this formation consist of highly faulted and tilted beds of conglomerate, sandstone and mudstone, interbedded in places with volcanic flows and tuffs and locally containing landslide debris and lenses of megabreccia (Anderson 1987a). Other subsurface information is presented in the Subsurface Investigations section of this report.

2.4 The surficial soil deposits as classified by the National Resource Conservation Service (previously Soil Conservation Service) are a Grabe-Anthony-Gila association consisting of level and nearly level to gently sloping soils that are dominantly loam to gravelly sandy loam, on flood plains and alluvial fans in the main channel of the river and Cave-Rillito-Mohave association consisting of nearly level to gently rolling soils that are dominantly gravelly loam and gravelly sandy loam, on low dissected terraces in portions of the banks away from the main channel (U. S. Dept of Agriculture, Soil Conservation Service, U of A Agricultural Experiment Station, Soil Survey of Tucson-Avra Valley Area, Arizona, April 1972).

A study by Jackson classified the soils in the channel as part of the T2 terrace, one of five terraces that exist in the Tucson Basin. The T2 terrace is defined as historically abandoned stream terraces occurring on the Santa Cruz River and Pantano Wash. Forms wide floodplain inset into stream valley. Soils are weakly developed (Torrifluvents). Topographically the T2 terrace is higher than T1 but several meters below T3. Gravelly sand dominates the sediments. Banks are unstable; recent incision and lateral erosion has left banks standing at an angle greater than the angle of repose, often vertical. Middle to late Holocene in age (Jackson, 1989).

FAULTING

2.4 The Tucson basin was formed during the Basin and Range disturbance of middle Miocene time (23 to 5 million years ago). A tectonic event was responsible for producing the deep basins and high ranges characteristic of present-day Basin and Range physiography. This extreme relief resulted from movement along deep-seated, high-angle normal faults. Anderson's (1987a) structural interpretation of the Tucson basin infers two major north to northwest-trending basin-bounding faults: the Santa Cruz fault and a segmented subparallel fault system on the north and east edges of the basin and a secondary, oblique, and generally northeast-trending fault system. The large-scale, low-angle structural feature that extends along a sinuous trace on the south and west flanks of the Santa Catalina and Rincon Mountains, respectively, is referred to as the Catalina detachment fault (Dickenson 1988). This feature represents a stage in the development of the Santa Catalina-Rincon Mountain metamorphic core complex during the mid-Tertiary Orogeny, which preceded the Basin and Range disturbance.

2.5 The concealed basin faults and the detachment fault are not considered to be active or capable faults and are not underlying this study area. The Basin and Range province in southwestern Arizona has been considered tectonically inactive since the waning of the Basin and Range disturbance during the early Pliocene (Anderson 1987a), due in part to the low levels of historical seismicity and the extensive pedimentation of mountain blocks (Pearthree et al. 1983). Quaternary faults are rare in southwestern Arizona and none have been identified in the Tucson metropolitan area (Menges and Pearthree 1983; Scarborough et al. 1986). The nearest concentration of Quaternary faults occurs along the western edge of the Santa Rita Mountains in southeastern Arizona, approximately 20 miles southeast of the study area. Pearthree (1986) estimated that the most recent movement along the Santa Rita fault occurred during the late Pleistocene. The Quaternary faulting observed in southeastern Arizona may represent minor reactivation of older Basin and Range structures or may be related to the Rio Grande Rift system of New Mexico (Pearthree et al. 1983).

SEISMICITY

2.6 The Tucson metropolitan area straddles the boundary between Zone 1 and Zone 2A of the Seismic Zone Map of the Contiguous States (Uniform Building Code, 1994 and USACE ER 1110-2-1806, dated 31 July 1995) and thus is located in a region of low to moderate seismic potential. Seismic activity has occurred throughout Arizona but southeastern Arizona (part of Zones 2A and 2B) is one of three regions where more frequent activity and earthquake epicenters with intensities greater than VI on the Modified Mercalli Scale and magnitudes greater than 4.0 have been concentrated (DuBois and Smith, et al. 1982). Estimates of average regional recurrence intervals between surface-rupturing earthquakes over the last 20,000 years for this portion of the state range from 3000 to 4000 years (Pearthree 1986). The report by Pearthree also contains a map of earthquake epicenters in the vicinity of Tucson.

2.7 The largest historical earthquake known to have affected the study area was the 1887 Sonora, Mexico, event with a maximum epicentral intensity of XII and an estimated magnitude of 7.2. An isoseismic map of the earthquake area in DuBois and Smith (1982) indicates an intensity of VII was experienced in the Tucson area. This event, although 130 miles southeast of the study area, resulted in rock falls and landslides in the Santa Catalina Mountains and caused widespread damage in Arizona as far north as Phoenix. A seismicity map of the State of Arizona compiled by Stover et al. (1986) indicates that the largest known historical earthquakes within 100 miles of the study area occurred near Nogales, Arizona, in 1916; in western Pima County in 1961; and near Globe, Arizona, in 1969. The 1916 event, approximately 60 miles south of Tucson, had a maximum epicentral intensity of VI. The 1961 event, about 90 miles west-northwest of Tucson, had a magnitude of 4.7, while the 1969 event, approximately 85 miles northeast of Tucson, had a magnitude of 4.4. Only three earthquakes have been reported within a 25-miles radius of the study area. Two of these events, with maximum epicentral intensities of IV, occurred in 1888, approximately 3 miles southwest of Tucson. The third, a magnitude 4.4 event, occurred in 1965 about 25 miles west of Tucson.

2.8 Using Schnabel and Seed's (1973) attenuation curves for horizontal acceleration in rock (USACE, South Pacific Division, 1979), the previously mentioned earthquakes would have produced maximum bedrock accelerations of less than 0.1g at the study site. By contrast, a maximum credible earthquake of magnitude 6.7 to 7.2 generated by movement on the 12 to 36-mile long Santa Rita fault would produce a maximum bedrock acceleration of approximately 0.2g at the study site. The Uniform Building Code and International Building Code both recommend accelerations of 0.2g for the Tucson metropolitan area.

GROUNDWATER

2.9 The main groundwater in the Tucson basin occurs in the sedimentary rocks and alluvium that form a single aquifer. The aquifer consists of the Pantano Formation, the Tinaja Beds, and the Fort Lowell Formation (from bottom to top) (Anderson 1987b). The Pantano Formation yields small to moderate amounts of water to wells while the Tinaja beds yield small to large amounts of water to wells, frequently in excess of 1000 gal/min (Anderson 1987b). The water table for this main aquifer is within 350 ft of the ground surface throughout most of the basin. Due to localized and/or perched water tables, the depth to groundwater ranges from less than 20 feet to about 170 ft below the ground surface along the Santa Cruz and Rillito Rivers (Babcock et al. 1988; City of Tucson 1996). Groundwater is generally under unconfined conditions. However, it may occur locally under confined or perched conditions. Groundwater movement is typically in a west-northwest direction, away from the basin margins toward the narrow northwest outlet (Osterkamp 1974). A groundwater contour map prepared by Tucson Water is attached to this report. This map shows the depth to groundwater throughout the Tucson Basin and in this study area.

2.10 We obtained information from the Arizona Department of Water Resources (ADWR) regarding depth of groundwater in wells in this study area. This information is included in Appendix C of this report. The key to the locations of the wells is also included in this Appendix. The wells with current water level readings are denoted with letters “A” through “K” on the right side of the well data sheets. These well locations are noted as ADWR Well Locations A through K on the aerial photo of the study region included with this report. The current well information included in this report indicates that depths to groundwater in the wells generally ranged from about 100 to 200 feet below ground surface in areas close to the Santa Cruz channel. Groundwater data were also obtained from soil borings made for bridges along the Santa Cruz River. Reports for the bridges at Congress, 22nd St., Irvington, and Valencia were reviewed. Information in these reports indicates groundwater (perched) was encountered at depths ranging from about 5 to 35 feet at Congress, Irvington, and Valencia. No groundwater was encountered in the test boring for the 22nd St. Bridge where the borings were advanced to depths of 45 to 60 feet. Due to the perched and/or localized nature of the groundwater along the Santa Cruz channel, these groundwater conditions are expected to vary in relation to flows in the River, well pumping, subsurface stratification, and other factors.

2.11 Long-term groundwater withdrawal has resulted in a general decline in water levels in the Tucson area since the 1900’s. This groundwater decline can be noted in the ADWR data for the depth to groundwater for the wells in this vicinity.

2.12 Large-scale pumping of groundwater in the Tucson basin began about 1900 and increased dramatically in the 1940's. Most of the groundwater pumped in 1940 was used for irrigation. Later, groundwater pumpage was approximately equally divided among irrigation, municipal, and industrial uses (Anderson et al. 1982). The centers of greatest water-level decline are along the Santa Cruz River near Sahuarita and in the City of Tucson. Declines exceeding 100 ft have occurred in Tucson and portions of the study area, while to the south along the river, the maximum decline has been about 150 ft (Schumann and Genualdi 1986). This difference has resulted in the formation of two distinct cones of depression in the groundwater table.

2.13 Infiltration of storm runoff in the stream channels during the rainy seasons is the major source of recharge to the groundwater basin (Davidson 1973). Seepage of runoff along the mountain fronts constitutes the second largest source of recharge. This natural system recharges about 100,000 acre-ft/yr; however, there is currently a demand for 300,000 to 400,000 acre-ft annually. The resulting deficit is causing the water table to decline at an approximate average annual rate of 2.7 ft (PCDOT 1986).

2.14 Several studies have been performed to evaluate the rate of recharge for both the Santa Cruz and Rillito Rivers (Wilson 1979; Katz 1987; Wilson and Newman 1987; Cluff et al. 1987). These studies attempted to evaluate the recharge rate using primarily empirical methods. The study by Katz indicated that the infiltration rates for all the studies ranged from 286 to 551 acre-feet/day for the Santa Cruz River and from 272 to 1,262 acre-feet/day for the Rillito. The studies by Cluff, et. al., and Wilson and Newman, evaluate the effects of channel stabilization on infiltration and ground water recharge. These reports are available at the Pima County Flood Control in-house library.

SUBSIDENCE, FISSURING AND COLLAPSING SOILS

2.15 Groundwater depletion in the Tucson basin has caused the aquifer system to compact. This compaction, in turn, has resulted in large areas of land subsidence, a problem that exists in other parts of the Basin and Range province of southern Arizona. The U.S. Geological Survey (USGS) is currently using seven vertical extensometer installations (VEIs) to measure and monitor aquifer compaction and water-level changes in the Tucson Basin. The VEIs are located in areas where the potential for land subsidence is believed to be large. Measurements made by the USGS from 1980 to the end of 1987 indicate that approximately 0.01 to 0.1 ft of compaction has occurred in the aquifer-system deposits underlying the basin during this period (Babcock et al. 1988). The amount of land subsidence resulting from aquifer compaction would be equal to the amount of compaction in all the compressible deposits of the aquifer. Since the water

wells used in the USGS study do not fully penetrate the aquifer, measured aquifer compaction would be less than or equal to the amount of land subsidence (Anderson et al. 1982). Thus, the greatest amount of land subsidence that has occurred in the Tucson basin between 1980 and 1987 is approximately 0.1 ft. This would equate to a subsidence rate of about 0.01 ft/yr. The closest VEI to the study area is located at well D-13-14 31cac, about 2-1/4 miles south of the Rillito River at First Avenue and about 2-1/2 miles northeast of the north end of this study area. A total of about 0.04 ft of aquifer compaction was measured at this installation. From 1982, this amount would correspond to a minimum subsidence rate of less than 0.01 ft/yr. An aquifer compaction study near the town of Eloy, Arizona, in the lower Santa Cruz basin, revealed that compaction and expansion of the aquifer materials corresponds to seasonal trends in water-level fluctuations, while measured land subsidence corresponds to net annual water-level declines (Schumann et al. 1986).

2.16 Land subsidence was also identified and measured by National Geodetic Survey releveling in the Tucson basin in 1980 (Anderson 1987b; Winikka 1984). Results indicated that from 1951-54 to 1979-80, land subsidence ranged from less than 0.1 ft to almost 0.5 ft; the largest amount occurred southeast of Tucson in an area south of Davis-Monthan Air Force Base, approximately 7 to 10 miles east of the Santa Cruz River channel. Subsidence generally was small in relation to water-level decline in the basin during this period. Long-term data indicate a ratio of subsidence to water-level decline of generally less than 0.003 foot per foot (Anderson 1987b).

2.1. The area of greatest potential land subsidence in the Tucson basin is from the Davis-Monthan Air Force Base area to south of Sahuarta, where water-level declines have been large (Anderson 1987b). Anderson (1987b) indicates that by the year 2030, approximately 3 to 10-plus feet of potential subsidence may result from a 200 to 400 foot decline in 1940 water levels in this region.

2.18 Earth fissures, produced in alluvial deposits by differential land subsidence, have not yet been reported in the Tucson basin but have been mapped near seven groundwater areas in southern Arizona where maximum water-level declines have equaled or exceeded 200 ft (Schumann et al. 1986). The greatest concentration of fissures is found about 30 miles north of Tucson in the lower Santa Cruz basin, which has experienced the most severe groundwater depletion. The closest earth-fissure sites to the study area are in the Avra Valley, approximately 20 miles west of Tucson.

2.19 Earth fissures, which generally occur on the periphery of subsidence areas, may eventually develop in the Tucson basin if the magnitude of groundwater depletion approaches that found in the areas noted above that presently contain fissures. Anderson (1987b) delineated zones of potential severe localized differential land

subsidence in the Tucson basin and noted that geohydrologic similarities with the Eloy-Picacho area in the lower Santa Cruz basin strongly indicate that earth fissures may occur in the Tucson basin by the year 2030, or perhaps sooner, assuming further ground water overdraft in the Tucson basin. The area from south of the Tucson International Airport to southeast of Sahuarita, which parallels a 15-mile segment of the Santa Cruz fault, was identified as the area most likely to be seriously affected by fissuring. However, a recent U.S. Geological Survey assessment of potential surface subsidence in response to overdraft in the Tucson area (Tucson Water et al. 1998) indicates that the Santa Cruz Mainstem in the Tucson Vicinity has potential to subside "less than two feet (0.6 m) to the north of the Interstate 19/I-10 interchange (the lowest number assigned in the potential ranking scheme) and no potential to subside south of that interchange." Those subsidence potential numbers represent a significant decrease in estimated subsidence potential from earlier U.S. Geological Survey work. The decrease is related to local control of groundwater pumping instituted in the interim between the two U.S. Geological Survey studies (Anderson 1987).

2.20 The ADWR well data indicate water-level declines exceeding 100 ft in the wells in the vicinity of this study. Therefore, this vicinity and the Tucson metropolitan area in general will likely to continue to be affected by subsidence as long as groundwater overdraft continues. Efforts are being made to reduce groundwater overdraft through water conservation and groundwater replacement. Specifically, the goal of the Tucson Active Management Area is to achieve a long-term balance of groundwater withdrawal with natural and artificial recharge by the year 2025 (USACE, 1986).

2.21 Collapsible soils are common in the southwestern desert environments where the natural evaporation greatly exceeds the precipitation. Collapsible soil deposits are formed when the alluvially deposited soils dry and form chemical bonds between the soil particles. These chemical bonds "tack weld" the soil particles together and give the soil a high dry strength. However, when these soils become wet, the chemical bonds weaken or dissolve and the soil structure reaches a point when it cannot withstand the applied overburden stress and the soil structure collapses. Structures supported on collapsing soils that undergo this collapsing phenomenon can undergo significant settlements and damage. Collapsing soils are typically composed of sands, silts and clays of low plasticity. These soils types and soils with collapsing potentials are known to exist within this vicinity. Usually, such collapsing soils occur at a distance of _ to 1 mile from the main channel of a river where silts and clays are deposited by channel overflows. Specific studies should be undertaken once the type of remedial measures have been determined to evaluate the existence of collapsing soils.

3. SUBSURFACE INVESTIGATIONS AND RESULTS

SUBSURFACE INVESTIGATIONS

3.1. The subsurface investigation for this study consisted of excavating shallow pits in the banks and bed of the rivers using a standard, wheel-mounted backhoe. These pits were excavated to maximum depths of about 10 feet below existing grade to obtain samples of the bed and bank materials to perform laboratory classification tests. The laboratory tests were performed to determine the gradation of the soil samples. Locations of the samples are noted on the site plan included with the maps in the jacket at the end of this report. Results of laboratory tests on these samples are presented in Appendix B of this report.

3.2. In addition to the sampling performed for this study, information from geotechnical engineering studies for several of the bridges along the Santa Cruz channel was reviewed - specifically the bridges at Congress, 22nd St., Irvington, and Valencia. Based on the information available in these reports and the authors' personal experience on other projects in this vicinity, the subsurface materials below the channels generally consist of sands and gravels, with some cobble layers. These soils generally become more granular and denser with increasing depth. However, some interbedded layers of silt and clay were also encountered in the borings for the Congress Bridge. These silt and clay layers existed at various depths in the borings, generally between about 15 and 50 feet. The perched water encountered in these borings appears to sit on top of the silt/clay layers. The subsurface soils are generally not cemented, although there is a heavily cemented layer approximately 25 feet below the riverbed at the site of the 22nd Street Bridge.

4. LABORATORY TESTING AND TEST RESULTS

4.1. Samples obtained in the backhoe test pits for this study were transported to the laboratory. Tests were performed on the samples to determine the gradation of all the samples. Atterberg Limits tests were performed on those samples determined to have significant portions of silt and clay.

4.2. Results of the laboratory tests are included in Appendix B of this report. The tests indicate that most of the soils sampled from the riverbed were sands with some gravel and relatively small percentages of silts and clays. The soils from the banks tend to be finer grained, especially toward the southern end of the study, specifically test locations

6, 7 and 8. The gradation test result plots have been separated for the materials obtained from the bed and banks of the river.

4.3. Pima County DOT specifications for soil cement mixtures to be used for soil-cement bank protection call for less than 15% passing the #200 sieve (0.074 mm) and a maximum aggregate size of 2 inches (50.8 mm) with a compressive strength of 750 psi (5,170 kPa) in 7 days. Their experience has shown that the required cement content is reduced if the percent soil passing the #200 sieve (0.06 mm) is in the range of 6 to 8 percent and the material is a well-graded sand. Therefore, most of the bed material samples obtained for this study could be used for soil cement, although some screening and blending of some of the materials would be required to achieve a gradation that would reduce the required cement content and increase the strength.

5. RESULTS OF THE VISUAL OBSERVATIONS

OBSERVATIONS

5.1. The photos included in Appendix A of this report are representative of the conditions along the Santa Cruz and West Branch of the Santa Cruz at the time of our field work. As shown (reference photos 6 – 12), soil cement bank protection extends along both sides of the Santa Cruz channel from Congress to approximately 300 feet south of Silverlake Road (29th St.). From that point south, sections of the bank of the main channel are protected by soil cement, but large sections of the channel are natural (reference photos 17 – 34). Many of these natural banks are nearly vertical (photos 17 – 23, 25, 26, 28) and some have developed tension cracks along the banks (photos 26, 28). There are also some soil cement grade control structures in the bed of the channel (photos 2, 3, 4). We also noted a soil cement apron across the main channel just north of Mission Lane. It appeared this apron was constructed to protect a fiber optics cable that crossed beneath the channel at this location.

5.2. The channel of the West Branch of the Santa Cruz north of Irvington was realigned. The original alignment extended roughly parallel to the main channel to the point of confluence near the site of the existing Pima County Jail (near 29th Street). Portions of the original alignment of this channel are shown in photos 31 – 34. The channel was diverted into the main branch of the Santa Cruz River just north of Irvington Road, as shown on the site plan accompanying this report. The diverted portion of the West Branch channel intersects the main channel just north of Irvington Road, at which point an energy dissipation structure has been constructed (reference photos 27 - 29). Some sections of the northern portion of this channel have bank protection consisting of vertical, driven railroad rails connected with cable interlaced

through a wire mesh filled with gravel and cobbles. Other portions of the banks of the West Branch, particularly near the southern end of the study area, are protected by shotcrete lining. Much of the bed of the diverted channel supports a dense growth of grass (photos 26 - 28). The portion of the channel extending from just north of Irvington Road currently carries only the flow from the tributary washes, primarily from the west, and much of the channel supports a dense growth of vegetation. The bed of the main channel of the Santa Cruz supports varying amounts and types of vegetation, depending on the amount of water available and the amount of water flow in that particular portion of the channel. As shown on most of the photos of the main channel, a relatively dense growth of grass, weeds, bushes (mainly desert broom) and some small trees (primarily salt cedars and mesquites) grow in the bed of the river. However, as illustrated on photos 1 – 25, 30, sparse to no vegetation exists in the low-flow channel.

LANDFILLS

5.3. Several previous studies have been conducted to locate landfills along the Santa Cruz River and its tributaries. One of these studies, *LANDFILLS AND WASTE DISPOSAL SITES ALONG THE SANTA CRUZ RIVER FROM GRANT ROAD TO PIMA MINE ROAD*, July 1996, summarizes the information in these studies and is included in the Appendix of this report. As noted in this report, landfills along the channels range from major landfills, such as the Rio Nuevo South and A Mountain areas, which were former City of Tucson landfills, to miscellaneous wildcat dumping. In addition to the landfills noted in this report, we noted additional wildcat surface dumping on the east bank of the main Santa Cruz channel just south of Drexel Road. Also, the landfill at Site 21, the 29th St. landfill, appeared to extend farther to the west and north than indicated on the site plan in that report.

6. BANK SLOPE STABILITY

6.1 The material generally encountered within the banks was typically a fine sandy silt. This material is not layered and has little plasticity but is cemented. There are very few cobble-sized rocks within this sandy silt material. As the cementation is readily broken down by water the material, due to its small grain size, enters a state where it is very susceptible to piping. Some areas of piping and surface sinkholes were noted along the alignment. Specifically, two-foot-diameter sinkholes were noted along the bank of the West Branch north of Irvington.

6.2 The stability of the existing native embankments is marginal due to the existence of two conditions. One, the natural cementation of the soils allows the banks to stand at

a near vertical inclination at many locations along the reaches of the study (reference photos 14 - 16 and 23-25). The vertical banks, when impacted by the any significant streamflow, are susceptible to being undercut at the bottom and collapsing into the streambed. The undercutting occurs mainly by the water breaking down the weak cementation present in the silty material. The second form of stream bank erosion is piping. As previously noted, the particle size of the slope embankment material is such that it is very susceptible to piping. Either surface or subsurface water flowing over or beneath the banks form large cavities or cave-like structures as the material is removed by piping thru the embankment and out its face.

7. BED DEGRADATION

7.1 Entrenchment of the channel into the previously unincised flood plain during the late 19th and early 20th centuries caused the greatest channel change on the Santa Cruz River in historical times. Vertical channel change has continued in entrenched and unentrenched reaches of the river over the past few decades. Scour and fill are transient changes in bed elevation that occur during floods. Degradation and aggradation occur over years to decades and may reflect climatic change, adjustments of channel widening or narrowing, sediment storage and episodic transport, and natural or artificial changes in channel-hydraulic properties. Degradation and aggradation can alternate in time and space. Most vertical channel change on the Santa Cruz River near Tucson has been degradational since the late 1950's. The most pronounced channel incision on the Santa Cruz channel has been from Ajo Way in the lower San Xavier reach to Grant Road in the middle of the Tucson reach where 10 to 15 feet of streambed lowering has occurred. The general pattern suggests stable or aggrading conditions through the mid-1950's, and limited evidence suggests that his period of vertical stability may have spanned the preceding 40 years. In the mid 1950's, the streambed at Ajo Way and 1.6 miles downstream at Silverlake Road rose 4 feet. (U.S. Geological Survey 1993). The period of most rapid degradation occurred between 1954 and 1972, when the Santa Cruz channel bed lowered between three to six feet. The cause of this historical channel bed degradation appears to be most directly related to the effects of urbanization such as encroachment along the channel banks, which limits the channel's natural meandering processes, and to the excavation of sand and gravel materials from the channel bed, which disturbs the natural sediment transport continuity of the system. The process of confining a natural, braided channel system into a single, well-defined channel has created increased flow velocities and correspondingly higher sediment transport capacities. As a direct consequence, the Santa Cruz River has responded, in general, by degrading. (Simons Li 1986).

8. CONSTRUCTION CONSIDERATIONS

8.1 Any plan to stabilize the slopes would have to be implemented during the dry season when the Santa Cruz River is not flowing. Wet seasonal times and, consequently, stream flow can be expected to occur during the monsoons of late July and August, the early fall time of late September and October, and during the December and January winter rains. During these times the channel can fill up with flow extending from bank to bank. As the predominate material comprising the channel bed is a fine gravelly sand, significant bed infiltration during flows and quick drainage of the bed material occurs once the stream flow subsides. Deep borings for the bridges have shown the presence of clay layers on which perched water could and, in some cases, does reside. Also, there are cemented soils and/or rock at relatively shallow depths in the vicinity of 22nd and 29th (Silverlake) Streets. The depth of such formations is typically more than 20 ft below the streambed elevation and, thus, would not impact the construction of even the deepest toe-down structures constructed in a soil-cement stabilization program.

11. FLOODING ON THE SANTA CRUZ RIVER

9.1 The greatest flooding that has occurred on the Santa Cruz River was in Sept. – Oct. 1983 when 7.5 inches (19 cm) of rain fell over Pima County within a 7-day period (4 inches (10 cm) fell on a single day). Peak gauged discharge at Congress Street was approximately 53,000 cfs. During this time the Santa Cruz River met and flowed into the Gila River, 50 miles to the north of Tucson.

During this flood event, people were killed, injured, had to be rescued or evacuated, and substantial property damage (> $200 million) occurred. Most of the damage resulted from bank erosion. Soil cement bank protection along the river prevented losses of at least four times the cost of such protection. Almost all of the flood damage was to structures constructed prior to floodplain management in Pima County.

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APPENDIX A

Site Photographs

Paseo de las Iglesias Photos
WO# 4FPDLI

LMT Project 21563

#1: Santa Cruz channel just S. of Congress

#2: Grade control structure S. of Congress in the main channel

#3: Grade control structure S of Congress in the main channel

#4: Grade control structure S of Congress in the main channel

#5: Santa Cruz channel S of Congress

#6: Santa Cruz channel just N of A Mtn

#7: Santa Cruz channel view S from Congress Bridge

#8: View to S. of main channel (22nd St Bridge in background)

#9: Santa Cruz channel - view N. of 22nd St. toward downtown

#10: View to S. of the main channel and the 29th St. Bridge

#11: View to S. of Santa Cruz channel S of Ajo

#12: View to S. of Santa Cruz channel 1/4 mile S of Ajo

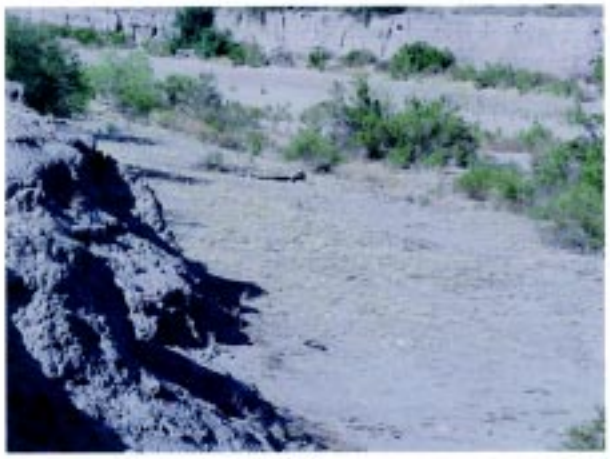
#13: Power pole base in Santa Cruz channel just S. of Drexel

#14: Same pole foundation as previous showing bed degradation

#15: East bank of Santa Cruz channel just N. of Valencia

#16: East bank of Santa Cruz channel north of Valencia

#17: Santa Cruz channel N of Valencia



#18: Santa Cruz channel N of Valencia

#19: Tension Cracks in W. bank, just S. of Valencia

#20: Valencia Bridge

#21: Tension Cracks in W. Bank just S. of Valencia

#22: Power pole base in Santa Cruz channel

#23: Santa Cruz channel west bank, south of Irvington (view to north)

#24: Santa Cruz channel bank, south of Irvington (view to south)

#25: Santa Cruz Riv. bank, south of Irvington (view to south) (closeup of previous photo)

#26: View Upstream of West Branch, just W. of the Santa Cruz channel intersection

#27: Energy dissipation structure @ W. Branch just upstream of Santa Cruz River

#28: Energy dissipators @ West Branch and Santa Cruz intersection (view to S)

#29: Intersection of W. Branch and Santa Cruz channels (view to N)

#30: Santa Cruz channel - view to S. just below W. Branch intersection

#31: W. Branch Santa Cruz south of Ajo near Mission (view to south)

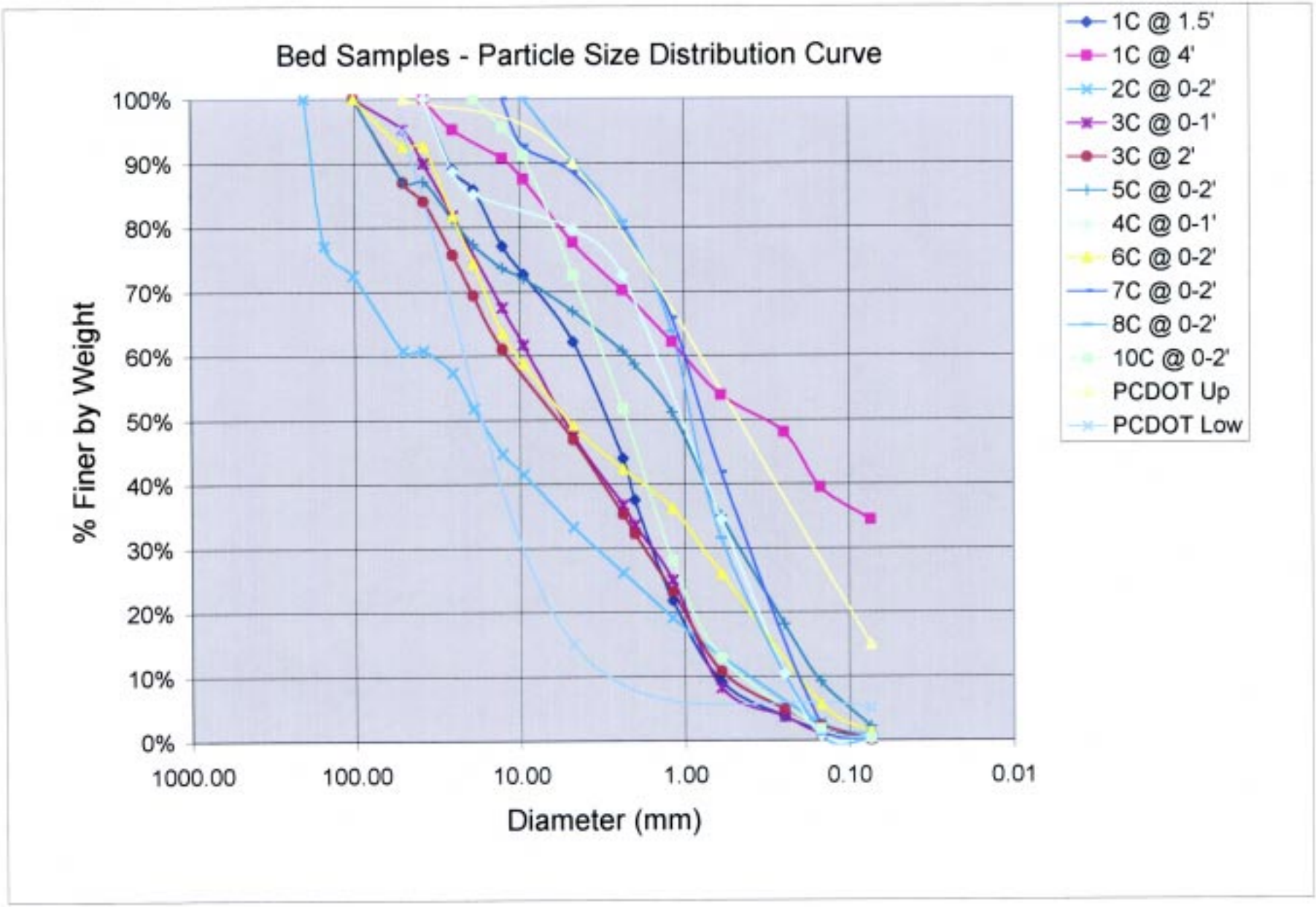
#32: W. Branch of Santa Cruz south of Ajo near Mission (view to south)

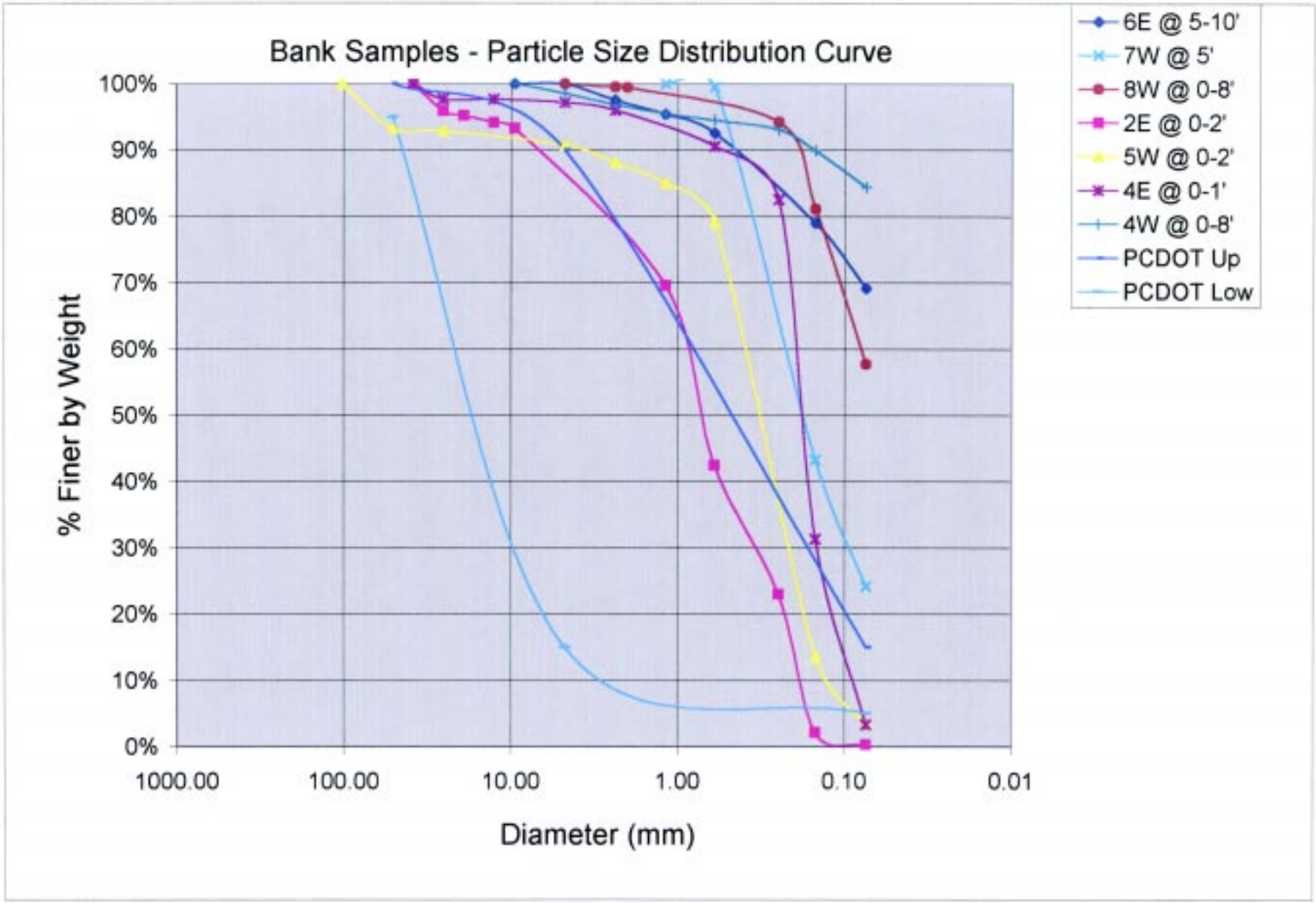
#33: View to south of the old (near) and new/diverted (distance) W. Branch channels

#34: View to north of the diverted (old) W Branch Channel

APPENDIX B

Laboratory Test Results


Bed Samples - Particle Size Distribution Curve
% Finer by Weight
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1000.00
100.00
10.00
1.00
0.10
0.01
Diameter (mm)
1C @ 1.5'
1C @ 4'
2C @ 0-2'
3C @ 0-1'
3C @ 2'
5C @ 0-2'
4C @ 0-1'
6C @ 0-2'
7C @ 0-2'
8C @ 0-2'
10C @ 0-2'
PCDOT Up
PCDOT Low


Bank Samples - Particle Size Distribution Curve
% Finer by Weight
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1000.00
100.00
10.00
1.00
0.10
0.01
Diameter (mm)
6E @ 5-10'
7W @ 5'
8W @ 0-8'
2E @ 0-2'
5W @ 0-2'
4E @ 0-1'
4W @ 0-8'
PCDOT Up
PCDOT Low

APPENDIX C

ADWR Well Data

11 Well Site Locations Selected

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1	D-14-13 11BAD	55-620304	321400110592101	01/08/60	77	2258
2		55-620304	321400110592101	01/29/62	82	2253
3		55-620304	321400110592101	02/01/63	87	2248
4		55-620304	321400110592101	01/29/64	90	2245
5		55-620304	321400110592101	02/02/65	90	2245
6		55-620304	321400110592101	07/26/65	96	2239
7		55-620304	321400110592101	02/01/68	89	2246
8		55-620304	321400110592101	02/10/69	89	2246
9		55-620304	321400110592101	05/01/70	93	2242
10		55-620304	321400110592101	02/01/71	94	2241
11		55-620304	321400110592101	02/01/72	97	2238
12		55-620304	321400110592101	02/01/73	99	2236
13		55-620304	321400110592101	12/28/81	120	2215
14		55-620304	321400110592101	12/01/82	120	2215
15		55-620304	321400110592101	01/06/84	113	2222
16		55-620304	321400110592101	01/06/85	113	2222
17		55-620304	321400110592101	12/30/85	110	2226
18		55-620304	321400110592101	12/30/86	111	2224
19		55-620304	321400110592101	12/28/87	114	2221
20		55-620304	321400110592101	01/06/89	116	2219
21		55-620304	321400110592101	12/26/90	122	2213
22		55-620304	321400110592101	12/18/91	124	2211
23		55-620304	321400110592101	01/21/94	127	2208
24		55-620304	321400110592101	02/03/95	129	2206
25		55-620304	321400110592101	01/09/97	133	2202
26		55-620304	321400110592101	02/11/98	136	2199
27		55-620304	321400110592101	12/02/98	137	2198
28		55-620304	321400110592101	01/03/00	149	2186
29	D-14-13 11BBB1	55-620302	321403110594201	01/21/94	130	2205
30	D-14-13 11DAA		321339110584201	01/01/65	60	2285
31	D-14-13 11DBB		321338110590701	03/12/53	59	2282
32			321338110590701	03/01/54	68	2273
33			321338110590701	02/04/55	67	2274
34			321338110590701	01/27/58	73	2268

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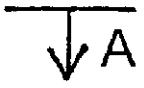
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
35			321338110590701	01/29/59	73	2268
36			321338110590701	01/30/61	79	2262
37			321338110590701	01/29/62	82	2259
38			321338110590701	01/31/63	90	2251
39			321338110590701	01/24/64	89	2252
40			321338110590701	02/02/65	89	2252
41			321338110590701	02/17/66	89	2252
42			321338110590701	01/25/67	87	2254
43			321338110590701	02/01/68	86	2255
44			321338110590701	02/01/69	89	2252
45			321338110590701	02/06/70	93	2248
46			321338110590701	02/18/71	93	2248
47			321338110590701	02/06/72	96	2245
48			321338110590701	02/15/73	98	2243
49			321338110590701	01/04/74	99	2242
50			321338110590701	01/03/75	109	2233
51			321338110590701	02/18/76	110	2231
52			321338110590701	02/01/77	111	2230
53			321338110590701	02/01/78	107	2234
54			321338110590701	02/01/79	105	2236
55			321338110590701	12/29/81	121	2220
56			321338110590701	12/15/83	108	2233
57			321338110590701	01/04/84	112	2229
58			321338110590701	12/10/84	110	2231
59			321338110590701	06/19/85	109	2232
60			321338110590701	12/03/85	110	2231
61			321338110590701	05/28/86	110	2231
62			321338110590701	06/03/87	115	2226
63	D-14-13 14CAB		321247110592001	09/11/39	28	2422
64			321247110592001	09/25/39	28	2422
65			321247110592001	11/13/39	28	2422
66			321247110592001	12/30/39	28	2422
67			321247110592001	02/19/40	27	2423
68	D-14-13 23ACA	55-619926	321209110585401	01/05/82	87	2283



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
69		55-619926	321209110585401	01/09/84	82	2288
70		55-619926	321209110585401	01/09/85	74	2296
71		55-619926	321209110585401	12/30/85	66	2304
72		55-619926	321209110585401	12/30/86	70	2300
73		55-619926	321209110585401	12/30/87	75	2295
74		55-619926	321209110585401	01/10/89	78	2292
75		55-619926	321209110585401	12/26/90	85	2285
76		55-619926	321209110585401	12/18/91	90	2280
77		55-619926	321209110585401	01/21/94	93	2277
78		55-619926	321209110585401	02/03/95	90	2280
79		55-619926	321209110585401	01/09/97	103	2267
80		55-619926	321209110585401	02/10/98	116	2254
81		55-619926	321209110585401	01/08/99	120	2250
82		55-619926	321209110585401	12/29/99	123	2247
83	D-14-13 23ACC	55-646738	321158110590101	12/30/81	82	2289
84		55-646738	321158110590101	01/05/84	85	2286
85		55-646738	321158110590101	11/30/87	78	2293
86		55-646738	321158110590101	01/16/95	92	2279
87		55-646738	321158110590101	02/28/00		
88	D-14-13 23ADC		321202110584901	09/29/39	19	2357
89	D-14-13 23BDA	55-619925	321207110591201	07/31/50	24	2339
90		55-619925	321207110591201	10/05/50	25	2338
91		55-619925	321207110591201	02/23/51	26	2337
92		55-619925	321207110591201	10/24/51	29	2334
93		55-619925	321207110591201	02/04/52	26	2337
94		55-619925	321207110591201	02/05/53	32	2331
95		55-619925	321207110591201	02/04/54	34	2329
96		55-619925	321207110591201	02/04/55	28	2335
97		55-619925	321207110591201	02/02/56	27	2336
98		55-619925	321207110591201	02/06/57	27	2336
99		55-619925	321207110591201	01/27/58	29	2334
100		55-619925	321207110591201	01/29/59	29	2334
101		55-619925	321207110591201	01/29/60	28	2335
102		55-619925	321207110591201	01/26/61	32	2331

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
103		55-619925	321207110591201	01/25/62	31	2332
104		55-619925	321207110591201	01/29/63	35	2328
105		55-619925	321207110591201	02/05/64	41	2322
106		55-619925	321207110591201	02/03/65	38	2325
107		55-619925	321207110591201	06/10/65	40	2323
108		55-619925	321207110591201	08/12/65	43	2320
109		55-619925	321207110591201	09/27/65	41	2322
110		55-619925	321207110591201	10/15/65	42	2321
111		55-619925	321207110591201	12/15/65	38	2325
112		55-619925	321207110591201	01/15/66	36	2327
113		55-619925	321207110591201	02/17/66	32	2331
114		55-619925	321207110591201	03/04/66	33	2330
115		55-619925	321207110591201	03/17/66	33	2330
116		55-619925	321207110591201	04/19/66	36	2327
117		55-619925	321207110591201	06/22/66	35	2328
118		55-619925	321207110591201	08/22/66	35	2329
119		55-619925	321207110591201	10/15/66	34	2329
120		55-619925	321207110591201	11/18/66	34	2330
121		55-619925	321207110591201	12/28/66	34	2329
122		55-619925	321207110591201	01/15/67	32	2331
123		55-619925	321207110591201	02/20/67	31	2332
124		55-619925	321207110591201	03/01/67	31	2332
125		55-619925	321207110591201	04/17/67	32	2331
126		55-619925	321207110591201	06/20/67	36	2327
127		55-619925	321207110591201	08/23/67	34	2329
128		55-619925	321207110591201	09/01/67	35	2328
129		55-619925	321207110591201	10/01/67	35	2328
130		55-619925	321207110591201	11/01/67	34	2329
131		55-619925	321207110591201	12/01/67	33	2330
132		55-619925	321207110591201	01/18/68	31	2332
133		55-619925	321207110591201	02/01/68	33	2330
134		55-619925	321207110591201	02/16/68	32	2331
135		55-619925	321207110591201	03/01/68	32	2331
136		55-619925	321207110591201	04/19/68	32	2331

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
137		55-619925	321207110591201	05/16/68	32	2331
138		55-619925	321207110591201	06/17/68	34	2329
139		55-619925	321207110591201	02/11/69	35	2328
140		55-619925	321207110591201	04/23/70	41	2322
141		55-619925	321207110591201	01/05/82	87	2276
142		55-619925	321207110591201	12/01/82	89	2274
143		55-619925	321207110591201	12/30/85	66	2297
144		55-619925	321207110591201	12/30/86	69	2294
145		55-619925	321207110591201	12/30/87	75	2288
146		55-619925	321207110591201	12/26/90	85	2278
147		55-619925	321207110591201	12/18/91	89	2274
148		55-619925	321207110591201	01/21/94	93	2270
149		55-619925	321207110591201	12/24/97	105	2258
150		55-619925	321207110591201	04/28/98	135	2228
151	D-14-13 23CAA1		321154110591201	01/23/46	55	2505
152	D-14-13 23CDD	55-802875	321134110591301	01/09/89	86	2299
153		55-802875	321134110591301	12/28/90	94	2291
154	D-14-13 26ACA	55-619921	321108110590901	12/06/30	21	2374
155		55-619921	321108110590901	12/16/31	17	2378
156		55-619921	321108110590901	02/15/32	16	2379
157		55-619921	321108110590901	02/01/33	16	2379
158		55-619921	321108110590901	01/01/34	16	2379
159		55-619921	321108110590901	01/01/35	18	2377
160		55-619921	321108110590901	01/21/36	17	2378
161		55-619921	321108110590901	02/24/37	18	2377
162		55-619921	321108110590901	01/18/38	20	2375
163		55-619921	321108110590901	01/01/39	21	2374
164		55-619921	321108110590901	02/01/40	21	2374
165		55-619921	321108110590901	01/01/41	22	2373
166		55-619921	321108110590901	02/28/47	78	2317
167		55-619921	321108110590901	02/10/49	32	2363
168		55-619921	321108110590901	02/10/50	35	2360
169		55-619921	321108110590901	02/22/51	37	2358
170		55-619921	321108110590901	02/08/52	36	2359

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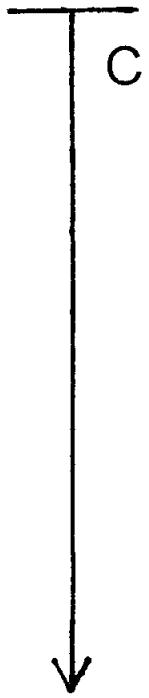
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
171		55-619921	321108110590901	02/05/53	40	2355
172		55-619921	321108110590901	02/04/54	40	2355
173		55-619921	321108110590901	02/07/55	36	2359
174		55-619921	321108110590901	02/29/56	33	2362
175		55-619921	321108110590901	02/07/57	36	2359
176		55-619921	321108110590901	01/27/58	37	2358
177		55-619921	321108110590901	01/29/59	38	2357
178		55-619921	321108110590901	01/29/60	37	2358
179		55-619921	321108110590901	01/26/61	42	2353
180		55-619921	321108110590901	01/24/62	42	2353
181		55-619921	321108110590901	01/29/63	47	2348
182		55-619921	321108110590901	01/28/64	50	2345
183		55-619921	321108110590901	02/03/65	48	2347
184	D-14-13 26BBC1	55-807626	321119110593601	09/30/81		
185	D-14-13 26BBC3	55-619908	321129110593401	01/21/52	37	2353
186		55-619908	321129110593401	02/02/53	38	2352
187		55-619908	321129110593401	02/08/54	39	2351
188		55-619908	321129110593401	02/04/55	36	2354
189		55-619908	321129110593401	02/08/56	32	2358
190		55-619908	321129110593401	02/08/57	36	2354
191		55-619908	321129110593401	01/28/58	37	2353
192		55-619908	321129110593401	01/28/59	37	2353
193		55-619908	321129110593401	01/29/60	37	2353
194		55-619908	321129110593401	01/31/61	40	2350
195		55-619908	321129110593401	01/30/62	40	2350
196		55-619908	321129110593401	02/01/63	46	2344
197		55-619908	321129110593401	01/27/64	49	2341
198		55-619908	321129110593401	02/05/68	48	2342
199		55-619908	321129110593401	01/11/69	50	2340
200		55-619908	321129110593401	12/28/81	97	2293
201		55-619908	321129110593401	12/30/81	97	2293
202		55-619908	321129110593401	12/01/82	103	2287
203		55-619908	321129110593401	01/09/84	94	2296
204		55-619908	321129110593401	01/08/85	83	2307



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
205		55-619908	321129110593401	12/31/85	80	2310
206		55-619908	321129110593401	01/02/87	82	2309
207		55-619908	321129110593401	12/30/87	85	2305
208		55-619908	321129110593401	12/26/90	99	2291
209		55-619908	321129110593401	01/21/94	105	2285
210		55-619908	321129110593401	02/02/95	105	2285
211	D-14-13 26BCA2		321118110592801	12/22/81		
212	D-14-13 26CDC		321045110592301	12/30/81	116	2285
213	D-14-13 26DBB	55-619920	321107110590801	01/17/30	22	2373
214		55-619920	321107110590801	12/01/30	24	2371
215		55-619920	321107110590801	02/15/32	19	2376
216		55-619920	321107110590801	02/01/33	18	2377
217		55-619920	321107110590801	01/01/34	19	2376
218		55-619920	321107110590801	01/01/35	20	2375
219		55-619920	321107110590801	01/21/36	20	2375
220		55-619920	321107110590801	01/01/37	22	2373
221		55-619920	321107110590801	01/18/38	23	2372
222		55-619920	321107110590801	01/01/39	24	2371
223		55-619920	321107110590801	02/01/40	24	2371
224		55-619920	321107110590801	01/01/41	25	2370
225		55-619920	321107110590801	02/28/47	32	2363
226		55-619920	321107110590801	02/10/49	35	2360
227		55-619920	321107110590801	02/10/50	37	2358
228		55-619920	321107110590801	02/22/51	39	2356
229		55-619920	321107110590801	02/08/52	39	2356
230		55-619920	321107110590801	02/05/53	43	2352
231		55-619920	321107110590801	02/09/54	43	2352
232		55-619920	321107110590801	02/07/55	41	2354
233		55-619920	321107110590801	02/29/56	36	2359
234		55-619920	321107110590801	02/07/57	39	2356
235		55-619920	321107110590801	01/27/58	40	2355
236		55-619920	321107110590801	01/29/59	42	2353
237		55-619920	321107110590801	01/29/60	41	2355
238		55-619920	321107110590801	01/26/61	45	2350

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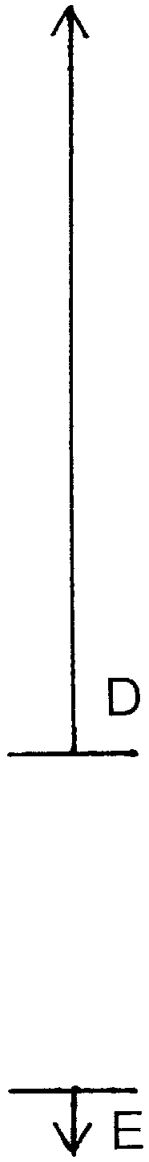
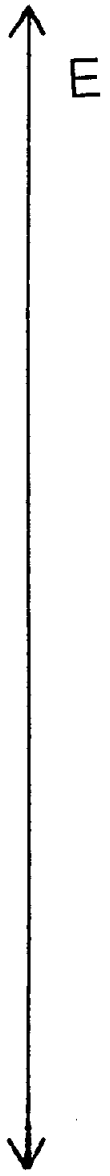
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
239		55-619920	321107110590801	01/24/62	46	2349
240		55-619920	321107110590801	01/29/63	51	2344
241		55-619920	321107110590801	01/27/64	55	2340
242		55-619920	321107110590801	02/03/65	54	2341
243		55-619920	321107110590801	02/17/66	51	2344
244		55-619920	321107110590801	02/02/68	50	2345
245		55-619920	321107110590801	02/11/69	55	2340
246		55-619920	321107110590801	01/03/75	90	2305
247		55-619920	321107110590801	01/05/82	108	2287
248		55-619920	321107110590801	01/06/84	103	2292
249		55-619920	321107110590801	01/09/85	91	2304
250		55-619920	321107110590801	12/30/85	90	2305
251		55-619920	321107110590801	12/30/87	94	2302
252		55-619920	321107110590801	01/09/89	99	2296
253		55-619920	321107110590801	12/26/90	108	2287
254		55-619920	321107110590801	12/18/91	112	2283
255		55-619920	321107110590801	01/21/94	114	2281
256		55-619920	321107110590801	02/02/95	116	2279
257		55-619920	321107110590801	01/09/97	136	2259
258		55-619920	321107110590801	02/10/98	144	2251
259		55-619920	321107110590801	01/09/99	147	2248
260		55-619920	321107110590801	12/29/99	152	2243
261	D-14-13 34ACA		321027110595501	02/07/55	52	2350
262			321027110595501	02/10/56	46	2357
263			321027110595501	02/11/57	52	2351
264			321027110595501	01/29/58	53	2349
265			321027110595501	01/30/59	53	2349
266			321027110595501	01/29/60	53	2349
267			321027110595501	01/30/61	57	2345
268			321027110595501	01/25/62	59	2343
269			321027110595501	01/28/63	62	2340
270	D-14-13 34AD		321020110594801	03/24/42	34	2391
271	D-14-13 34ADC		321017110595001	12/08/30	29	2386
272			321017110595001	02/07/31	28	2387



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
273			321017110595001	03/06/31	28	2387
274			321017110595001	01/19/32	25	2390
275			321017110595001	02/24/32	25	2390
276			321017110595001	08/01/32	27	2388
277			321017110595001	09/01/32	27	2388
278			321017110595001	10/01/32	27	2388
279			321017110595001	11/01/32	27	2388
280			321017110595001	12/01/32	26	2389
281			321017110595001	01/01/33	25	2390
282			321017110595001	09/01/34	30	2385
283			321017110595001	11/01/34	30	2385
284			321017110595001	12/01/34	29	2386
285			321017110595001	01/01/35	28	2387
286			321017110595001	09/01/35	33	2382
287			321017110595001	12/01/35	28	2387
288			321017110595001	02/05/36	28	2387
289			321017110595001	04/01/36	28	2387
290			321017110595001	02/24/37	29	2386
291			321017110595001	09/01/37	32	2383
292			321017110595001	10/13/37	32	2383
293			321017110595001	11/17/37	32	2383
294			321017110595001	12/21/37	32	2383
295			321017110595001	01/18/38	31	2384
296			321017110595001	03/16/38	30	2385
297			321017110595001	04/14/38	31	2384
298			321017110595001	05/16/38	32	2383
299			321017110595001	10/01/38	34	2381
300			321017110595001	11/01/38	33	2382
301			321017110595001	12/01/38	33	2382
302			321017110595001	01/01/39	32	2383
303			321017110595001	02/01/39	31	2384
304			321017110595001	09/01/39	34	2381
305			321017110595001	11/01/39	32	2383
306			321017110595001	02/01/40	31	2384



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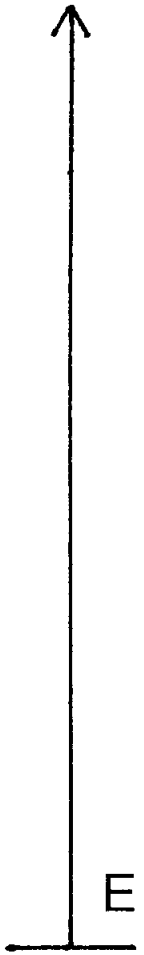
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
307			321017110595001	03/01/40	30	2385
308			321017110595001	07/01/40	34	2381
309			321017110595001	10/01/40	34	2381
310			321017110595001	01/01/41	32	2383
311			321017110595001	03/01/41	30	2385
312			321017110595001	06/16/41	33	2382
313			321017110595001	02/26/42	32	2383
314			321017110595001	10/20/42	38	2377
315			321017110595001	02/05/52	52	2363
316			321017110595001	02/05/53	55	2360
317			321017110595001	02/09/54	58	2357
318			321017110595001	02/07/55	52	2363
319			321017110595001	02/10/56	47	2368
320			321017110595001	02/11/57	53	2362
321			321017110595001	01/29/58	54	2361
322			321017110595001	02/02/59	54	2361
323			321017110595001	01/29/60	58	2357
324			321017110595001	01/31/61	58	2357
325			321017110595001	01/30/62	59	2356
326			321017110595001	02/04/63	63	2352
327			321017110595001	01/29/64	68	2348
328			321017110595001	02/04/65	65	2350
329			321017110595001	01/26/67	62	2353
330			321017110595001	02/09/70	76	2339
331			321017110595001	12/30/81	131	2285
332			321017110595001	11/30/87	113	2302
333			321017110595001	01/16/95	140	2275
334			321017110595001	02/28/00		
335	D-14-13 34DCD		320950110595801	09/28/39	33	2392
336			320950110595801	11/06/39	33	2392
337			320950110595801	12/26/39	32	2393
338			320950110595801	02/11/40	31	2394
339			320950110595801	03/18/40	32	2393
340			320950110595801	05/01/40	32	2393



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
341			320950110595801	05/28/40	33	2392
342			320950110595801	08/13/40	19	2406
343			320950110595801	10/04/40	18	2407
344	D-14-13 34DDC		320951110595001	09/28/39	33	2392
345			320951110595001	10/04/40	36	2389
346			320951110595001	11/05/40	37	2388
347			320951110595001	02/24/41	34	2391
348			320951110595001	03/25/41	34	2391
349			320951110595001	04/28/41	35	2390
350			320951110595001	09/30/41	38	2387
351			320951110595001	11/13/41	37	2388
352			320951110595001	12/29/41	36	2389
353			320951110595001	03/24/42	35	2390
354			320951110595001	12/23/42	38	2387
355			320951110595001	10/26/43	41	2384
356			320951110595001	11/18/43	40	2385
357			320951110595001	01/14/44	38	2387
358			320951110595001	10/13/44	46	2379
359			320951110595001	12/11/44	42	2383
360			320951110595001	03/10/45	41	2384
361			320951110595001	10/12/45	48	2377
362			320951110595001	10/15/45	47	2378
363			320951110595001	12/06/45	45	2380
364			320951110595001	05/08/46	46	2379
365			320951110595001	07/23/46	50	2375
366			320951110595001	09/30/46	47	2378
367			320951110595001	10/11/46	46	2379
368			320951110595001	10/12/46	48	2377
369			320951110595001	12/02/46	44	2381
370			320951110595001	12/06/46	45	2380
371			320951110595001	03/31/47	45	2380
372			320951110595001	04/29/47	46	2379
373			320951110595001	07/14/47	52	2373
374			320951110595001	07/15/47	52	2373

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
375			320951110595001	09/26/47	52	2373
376			320951110595001	10/01/47	51	2375
377			320951110595001	10/28/47	50	2375
378			320951110595001	05/21/48	52	2373
379			320951110595001	06/18/48	54	2371
380			320951110595001	07/28/48	56	2369
381			320951110595001	08/24/48	56	2369
382			320951110595001	09/30/48	56	2369
383			320951110595001	10/11/48	56	2369
384			320951110595001	10/25/48	55	2370
385			320951110595001	11/26/48	53	2372
386			320951110595001	01/27/49	49	2376
387			320951110595001	02/07/49	49	2376
388			320951110595001	09/26/49	58	2367
389			320951110595001	10/13/49	57	2368
390			320951110595001	12/16/49	54	2371
391			320951110595001	02/06/50	55	2370
392			320951110595001	09/19/50	59	2366
393			320951110595001	09/26/50	59	2366
394			320951110595001	11/30/50	58	2367
395			320951110595001	12/16/50	52	2373
396			320951110595001	01/18/51	56	2369
397			320951110595001	02/23/51	54	2371
398			320951110595001	12/17/51	58	2367
399			320951110595001	02/08/52	58	2367
400			320951110595001	05/19/52	57	2368
401			320951110595001	11/13/52	63	2362
402			320951110595001	02/03/53	58	2367
403			320951110595001	02/05/53	58	2367
404			320951110595001	04/23/53	59	2366
405			320951110595001	10/21/53	57	2368
406			320951110595001	02/08/54	63	2362
407			320951110595001	05/17/54	63	2362
408			320951110595001	08/04/54	67	2358

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
409			320951110595001	11/08/54	62	2363
410			320951110595001	01/04/55	61	2364
411			320951110595001	02/07/55	57	2368
412			320951110595001	03/25/55	59	2367
413			320951110595001	10/28/55	55	2370
414			320951110595001	01/04/56	51	2374
415			320951110595001	02/10/56	50	2375
416			320951110595001	08/10/56	60	2365
417			320951110595001	02/01/57	55	2370
418			320951110595001	02/11/57	56	2369
419			320951110595001	07/19/57	62	2363
420			320951110595001	12/27/57	58	2367
421			320951110595001	01/29/58	58	2367
422			320951110595001	02/02/59	59	2366
423			320951110595001	01/05/60	61	2364
424			320951110595001	01/29/60	59	2366
425			320951110595001	01/30/61	63	2362
426			320951110595001	02/02/61	63	2362
427			320951110595001	01/25/62	65	2360
428			320951110595001	02/21/62	65	2360
429			320951110595001	10/10/62	74	2351
430			320951110595001	01/31/63	71	2354
431			320951110595001	02/04/63	71	2354
432			320951110595001	01/27/64	74	2351
433			320951110595001	03/05/64	79	2346
434			320951110595001	01/12/65	79	2346
435			320951110595001	02/04/65	72	2353
436			320951110595001	01/10/66	72	2353
437			320951110595001	02/17/66	70	2355
438			320951110595001	03/23/67	75	2350
439			320951110595001	12/11/74	112	2313
440			320951110595001	12/30/81		
441	D-14-13 34DDD		320947110594001	10/26/43	41	2382
442			320947110594001	10/13/44	46	2377

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
443			320947110594001	12/11/44	42	2381
444			320947110594001	03/10/45	41	2382
445			320947110594001	10/15/45	47	2376
446			320947110594001	05/08/46	44	2379
447			320947110594001	07/23/46	48	2375
448			320947110594001	09/30/46	46	2377
449			320947110594001	10/11/46	44	2379
450			320947110594001	10/23/46	45	2378
451			320947110594001	12/02/46	42	2381
452			320947110594001	12/24/46	42	2381
453			320947110594001	03/31/47	43	2380
454			320947110594001	04/29/47	44	2379
455			320947110594001	09/26/47	50	2373
456			320947110594001	10/27/47	50	2373
457			320947110594001	10/28/47	48	2375
458			320947110594001	05/02/48	52	2371
459			320947110594001	06/18/48	54	2369
460			320947110594001	07/28/48	56	2367
461			320947110594001	08/24/48	56	2367
462			320947110594001	09/30/48	56	2367
463			320947110594001	10/11/48	55	2368
464			320947110594001	10/28/48	55	2368
465			320947110594001	11/26/48	53	2370
466			320947110594001	02/07/49	55	2368
467			320947110594001	09/19/50	59	2364
468			320947110594001	02/23/51	54	2369
469			320947110594001	02/08/52	58	2365
470			320947110594001	02/05/53	59	2364
471			320947110594001	02/11/54	62	2361
472			320947110594001	02/07/55	57	2366
473			320947110594001	02/10/56	50	2373
474			320947110594001	02/11/57	56	2367
475			320947110594001	01/29/58	58	2365
476			320947110594001	02/02/59	58	2365

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
477			320947110594001	01/29/60	60	2363
478			320947110594001	01/30/61	63	2360
479			320947110594001	01/25/62	65	2358
480			320947110594001	02/04/63	69	2354
481			320947110594001	01/27/64	74	2349
482			320947110594001	02/04/65	72	2351
483			320947110594001	01/26/67	69	2354
484			320947110594001	02/01/72	84	2339
485			320947110594001	01/24/73	86	2337
486			320947110594001	02/01/78	116	2307
487			320947110594001	02/01/79	113	2310
488	D-14-13 35AAC	55-620202	321030110584901	02/28/68	87	2345
489		55-620202	321030110584901	01/01/82	147	2285
490		55-620202	321030110584901	08/13/84	138	2295
491		55-620202	321030110584901	12/30/85	126	2306
492	D-14-13 35ADA	55-620202	321025110584801	10/10/85	141	2297
493		55-620202	321025110584801	12/30/85	126	2312
494		55-620202	321025110584801	05/20/86	137	2301
495		55-620202	321025110584801	11/17/86	141	2297
496		55-620202	321025110584801	05/26/87	140	2298
497		55-620202	321025110584801	05/16/91	166	2272
498		55-620202	321025110584801	12/23/91	150	2288
499		55-620202	321025110584801	12/16/94	157	2281
500		55-620202	321025110584801	01/16/97	183	2255
501		55-620202	321025110584801	12/05/97	183	2255
502		55-620202	321025110584801	04/30/98	216	2222
503		55-620202	321025110584801	01/27/99	183	2255
504		55-620202	321025110584801	02/02/00	194	2244
505	D-14-13 35ADC		321014110584501	02/10/49	70	2374
506			321014110584501	10/13/49	78	2366
507			321014110584501	02/09/50	74	2370
508			321014110584501	02/26/51	75	2369
509			321014110584501	10/24/51	82	2362
510			321014110584501	02/01/52	77	2367

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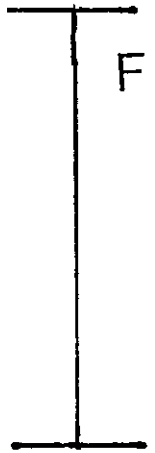
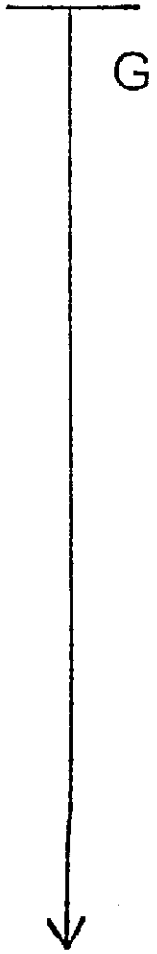
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
511			321014110584501	02/01/53	80	2364
512			321014110584501	02/08/54	81	2363
513			321014110584501	02/09/55	78	2366
514			321014110584501	02/10/56	71	2374
515			321014110584501	02/11/57	76	2368
516			321014110584501	01/29/58	78	2366
517			321014110584501	01/30/59	79	2365
518			321014110584501	02/01/60	80	2364
519			321014110584501	01/27/61	83	2361
520			321014110584501	01/25/62	86	2358
521			321014110584501	02/04/63	90	2354
522			321014110584501	01/28/64	94	2350
523			321014110584501	02/03/65	93	2351
524			321014110584501	02/20/66	90	2354
525			321014110584501	01/26/67	88	2356
526			321014110584501	02/02/68	87	2357
527			321014110584501	02/14/69	96	2348
528			321014110584501	02/09/70	109	2335
529	D-14-13 35BAB	55-619930	321033110592101	06/01/66	60	2340
530		55-619930	321033110592101	12/01/82	127	2273
531		55-619930	321033110592101	01/06/84	114	2286
532		55-619930	321033110592101	01/08/85	99	2301
533		55-619930	321033110592101	12/30/85	98	2302
534		55-619930	321033110592101	01/09/89	110	2291
535		55-619930	321033110592101	12/26/90	118	2282
536		55-619930	321033110592101	02/03/95	129	2271
537		55-619930	321033110592101	12/16/96	142	2258
538		55-619930	321033110592101	12/24/97	150	2250
539		55-619930	321033110592101	05/19/98	172	2229
540		55-619930	321033110592101	11/18/98	150	2250
541		55-619930	321033110592101	12/28/99	160	2240
542	D-14-13 35BDC		321017110591901	09/29/39	34	2378
543			321017110591901	10/04/40	35	2377
544			321017110591901	09/30/41	35	2377



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
545			321017110591901	09/29/42	39	2373
546			321017110591901	09/29/43	41	2371
547			321017110591901	09/28/44	44	2368
548			321017110591901	10/22/45	44	2368
549			321017110591901	10/11/46	43	2369
550			321017110591901	09/26/47	49	2363
551	D-14-13 35CAA	55-619922	321008110590801	02/10/50	61	2364
552		55-619922	321008110590801	02/06/52	62	2363
553		55-619922	321008110590801	02/06/53	66	2359
554		55-619922	321008110590801	02/11/54	67	2358
555		55-619922	321008110590801	02/10/55	63	2362
556		55-619922	321008110590801	02/10/56	57	2368
557		55-619922	321008110590801	02/07/57	62	2363
558		55-619922	321008110590801	01/28/58	64	2361
559		55-619922	321008110590801	01/30/59	64	2361
560		55-619922	321008110590801	02/01/60	65	2360
561		55-619922	321008110590801	01/27/61	69	2356
562		55-619922	321008110590801	01/25/62	71	2354
563		55-619922	321008110590801	01/29/63	76	2349
564		55-619922	321008110590801	01/27/64	81	2344
565		55-619922	321008110590801	02/03/65	82	2343
566		55-619922	321008110590801	06/11/65	86	2339
567		55-619922	321008110590801	02/02/68	86	2339
568		55-619922	321008110590801	02/14/69	89	2336
569		55-619922	321008110590801	04/23/70	88	2337
570		55-619922	321008110590801	01/05/82	139	2286
571		55-619922	321008110590801	01/09/84	132	2293
572		55-619922	321008110590801	01/08/85	118	2307
573		55-619922	321008110590801	12/30/85	117	2308
574		55-619922	321008110590801	01/02/87	116	2309
575		55-619922	321008110590801	12/30/87	121	2304
576		55-619922	321008110590801	12/28/90	137	2288
577		55-619922	321008110590801	12/23/91	141	2284
578		55-619922	321008110590801	02/02/95	153	2272



Arizona Department of Water Resources
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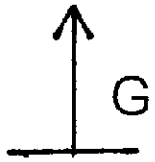
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
579		55-619922	321008110590801	12/30/96	174	2251
580		55-619922	321008110590801	02/10/98	180	2245
581		55-619922	321008110590801	12/24/98	184	2241
582		55-619922	321008110590801	12/29/99	187	2238
583	D-14-13 35CAB	55-619919	321008110592001	03/16/31	30	2380
584		55-619919	321008110592001	04/15/31	31	2379
585		55-619919	321008110592001	06/16/31	33	2377
586		55-619919	321008110592001	07/15/31	33	2377
587		55-619919	321008110592001	09/15/31	30	2380
588		55-619919	321008110592001	11/16/31	30	2380
589		55-619919	321008110592001	01/16/32	28	2382
590		55-619919	321008110592001	02/15/32	28	2382
591		55-619919	321008110592001	07/01/32	29	2381
592		55-619919	321008110592001	11/01/32	30	2380
593		55-619919	321008110592001	01/01/34	29	2381
594		55-619919	321008110592001	03/01/34	30	2380
595		55-619919	321008110592001	04/01/34	30	2380
596		55-619919	321008110592001	05/01/34	31	2379
597		55-619919	321008110592001	06/01/34	32	2378
598		55-619919	321008110592001	09/01/34	32	2378
599		55-619919	321008110592001	01/01/35	30	2380
600		55-619919	321008110592001	03/01/35	30	2380
601		55-619919	321008110592001	08/01/35	31	2379
602		55-619919	321008110592001	09/01/35	31	2379
603		55-619919	321008110592001	10/01/35	31	2379
604		55-619919	321008110592001	12/01/35	30	2380
605		55-619919	321008110592001	01/21/36	30	2380
606		55-619919	321008110592001	04/01/36	31	2379
607		55-619919	321008110592001	02/24/37	31	2379
608		55-619919	321008110592001	04/23/37	33	2377
609		55-619919	321008110592001	06/10/37	33	2378
610		55-619919	321008110592001	07/15/37	34	2376
611		55-619919	321008110592001	09/19/37	34	2376
612		55-619919	321008110592001	10/13/37	34	2376



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
613		55-619919	321008110592001	11/17/37	34	2376
614		55-619919	321008110592001	12/21/37	33	2377
615		55-619919	321008110592001	01/18/38	33	2377
616		55-619919	321008110592001	02/17/38	32	2378
617		55-619919	321008110592001	03/16/38	33	2377
618		55-619919	321008110592001	04/14/38	33	2377
619		55-619919	321008110592001	05/16/38	35	2375
620		55-619919	321008110592001	08/18/38	31	2379
621		55-619919	321008110592001	10/01/38	36	2374
622		55-619919	321008110592001	12/01/38	35	2375
623		55-619919	321008110592001	01/01/39	34	2376
624		55-619919	321008110592001	02/01/39	33	2377
625		55-619919	321008110592001	03/01/40	32	2378
626		55-619919	321008110592001	10/01/40	36	2374
627		55-619919	321008110592001	01/01/41	33	2377
628		55-619919	321008110592001	02/28/47	45	2365
629		55-619919	321008110592001	10/28/47	49	2361
630		55-619919	321008110592001	02/10/50	53	2357
631		55-619919	321008110592001	02/05/52	54	2356
632		55-619919	321008110592001	02/05/53	56	2354
633		55-619919	321008110592001	02/11/54	58	2352
634		55-619919	321008110592001	02/10/55	54	2356
635		55-619919	321008110592001	02/10/56	47	2363
636		55-619919	321008110592001	02/07/57	54	2356
637		55-619919	321008110592001	01/28/58	55	2355
638		55-619919	321008110592001	01/30/59	56	2354
639		55-619919	321008110592001	02/01/60	56	2354
640		55-619919	321008110592001	01/27/61	60	2350
641		55-619919	321008110592001	01/24/62	62	2348
642		55-619919	321008110592001	01/28/63	66	2344
643		55-619919	321008110592001	01/27/64	70	2340
644		55-619919	321008110592001	02/02/65	69	2341
645		55-619919	321008110592001	06/09/65	72	2338
646		55-619919	321008110592001	07/15/65	75	2335

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
647		55-619919	321008110592001	08/10/65	76	2334
648		55-619919	321008110592001	09/21/65	74	2336
649		55-619919	321008110592001	10/15/65	75	2335
650		55-619919	321008110592001	12/15/65	73	2338
651		55-619919	321008110592001	01/15/66	73	2338
652		55-619919	321008110592001	04/19/66	69	2341
653		55-619919	321008110592001	08/28/67	72	2338
654		55-619919	321008110592001	09/01/67	72	2338
655		55-619919	321008110592001	10/25/67	70	2340
656		55-619919	321008110592001	11/20/67	73	2338
657		55-619919	321008110592001	12/20/67	70	2340
658		55-619919	321008110592001	01/18/68	69	2342
659		55-619919	321008110592001	02/02/68	75	2335
660		55-619919	321008110592001	02/16/68	68	2342
661		55-619919	321008110592001	03/01/68	66	2344
662		55-619919	321008110592001	04/11/68	68	2342
663		55-619919	321008110592001	05/16/68	70	2341
664		55-619919	321008110592001	06/17/68	70	2340
665		55-619919	321008110592001	04/23/70	80	2330
666		55-619919	321008110592001	01/05/82	131	2279
667		55-619919	321008110592001	01/09/84	124	2286
668		55-619919	321008110592001	01/08/85	109	2301
669		55-619919	321008110592001	12/30/85	109	2301
670		55-619919	321008110592001	01/02/87	108	2302
671		55-619919	321008110592001	12/30/87	113	2297
672		55-619919	321008110592001	01/09/89	121	2289
673		55-619919	321008110592001	12/28/90	129	2281
674		55-619919	321008110592001	12/23/91	133	2277
675		55-619919	321008110592001	02/02/95	143	2267
676	D-14-13 35CAC1	55-619910	321003110592101	05/15/31	29	2386
677		55-619910	321003110592101	09/15/31	28	2387
678		55-619910	321003110592101	11/16/31	27	2388
679		55-619910	321003110592101	04/01/32	25	2390
680		55-619910	321003110592101	05/01/32	26	2389

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
681		55-619910	321003110592101	06/01/32	27	2388
682		55-619910	321003110592101	08/01/32	25	2390
683		55-619910	321003110592101	09/01/32	27	2388
684		55-619910	321003110592101	11/01/32	26	2389
685		55-619910	321003110592101	12/01/32	26	2389
686		55-619910	321003110592101	03/01/33	29	2386
687		55-619910	321003110592101	07/01/33	28	2387
688		55-619910	321003110592101	01/01/34	22	2393
689		55-619910	321003110592101	02/01/34	23	2392
690		55-619910	321003110592101	03/01/34	24	2391
691		55-619910	321003110592101	04/01/34	23	2392
692		55-619910	321003110592101	06/01/34	25	2390
693		55-619910	321003110592101	07/01/34	27	2388
694		55-619910	321003110592101	10/01/34	26	2389
695		55-619910	321003110592101	01/01/35	24	2391
696		55-619910	321003110592101	04/01/35	25	2390
697		55-619910	321003110592101	04/01/36	29	2386
698		55-619910	321003110592101	06/10/37	32	2383
699		55-619910	321003110592101	07/15/37	32	2383
700		55-619910	321003110592101	08/19/37	32	2383
701		55-619910	321003110592101	09/16/37	32	2383
702		55-619910	321003110592101	10/13/37	32	2383
703		55-619910	321003110592101	11/17/37	32	2383
704		55-619910	321003110592101	12/21/37	31	2384
705		55-619910	321003110592101	01/18/38	31	2384
706		55-619910	321003110592101	02/17/38	31	2384
707		55-619910	321003110592101	03/16/38	31	2385
708		55-619910	321003110592101	04/14/38	31	2384
709		55-619910	321003110592101	05/16/38	33	2382
710		55-619910	321003110592101	08/18/38	34	2381
711		55-619910	321003110592101	10/01/38	34	2381
712		55-619910	321003110592101	11/01/38	34	2381
713		55-619910	321003110592101	12/01/38	33	2382
714		55-619910	321003110592101	01/01/39	32	2383

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
715		55-619910	321003110592101	02/01/39	31	2384
716		55-619910	321003110592101	03/01/40	32	2383
717		55-619910	321003110592101	10/01/40	34	2381
718		55-619910	321003110592101	01/01/41	32	2383
719		55-619910	321003110592101	10/13/49	57	2358
720		55-619910	321003110592101	02/10/50	50	2365
721		55-619910	321003110592101	02/06/52	51	2364
722		55-619910	321003110592101	02/05/53	55	2360
723		55-619910	321003110592101	02/11/54	56	2359
724		55-619910	321003110592101	02/10/55	52	2363
725		55-619910	321003110592101	02/01/56	45	2370
726		55-619910	321003110592101	02/07/57	51	2364
727		55-619910	321003110592101	01/28/58	53	2362
728		55-619910	321003110592101	01/30/59	54	2361
729		55-619910	321003110592101	01/29/60	53	2362
730		55-619910	321003110592101	01/27/61	61	2354
731		55-619910	321003110592101	01/24/62	60	2355
732		55-619910	321003110592101	01/28/63	64	2351
733		55-619910	321003110592101	01/27/64	68	2347
734		55-619910	321003110592101	02/02/65	67	2348
735		55-619910	321003110592101	06/09/65	72	2343
736		55-619910	321003110592101	10/29/65	75	2340
737		55-619910	321003110592101	02/02/68	73	2342
738		55-619910	321003110592101	02/01/69	73	2342
739		55-619910	321003110592101	04/23/70	81	2334
740		55-619910	321003110592101	01/05/82	133	2282
741		55-619910	321003110592101	12/01/82	140	2275
742		55-619910	321003110592101	01/09/84	126	2290
743		55-619910	321003110592101	01/08/85	110	2305
744		55-619910	321003110592101	12/30/85	110	2305
745		55-619910	321003110592101	01/02/87	110	2305
746		55-619910	321003110592101	12/30/87	114	2301
747		55-619910	321003110592101	01/09/89	123	2292
748		55-619910	321003110592101	12/28/90	130	2285

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
749		55-619910	321003110592101	12/31/91	136	2279
750		55-619910	321003110592101	02/02/95	145	2270
751		55-619910	321003110592101	12/13/96	166	2249
752		55-619910	321003110592101	02/02/99	170	2245
753		55-619910	321003110592101	12/22/99	180	2235
754	D-14-13 35CCC		320950110593501	02/20/48	46	2378
755			320950110593501	03/19/48	47	2377
756			320950110593501	06/18/48	52	2372
757			320950110593501	10/11/48	54	2371
758			320950110593501	02/07/49	46	2378
759			320950110593501	06/27/49	56	2368
760			320950110593501	10/13/49	55	2369
761			320950110593501	02/23/51	51	2373
762			320950110593501	01/21/52	56	2368
763			320950110593501	02/05/52	54	2370
764			320950110593501	02/09/54	58	2366
765			320950110593501	02/07/55	54	2370
766			320950110593501	02/10/56	47	2377
767			320950110593501	02/11/57	53	2371
768			320950110593501	01/29/58	55	2369
769			320950110593501	02/02/59	55	2369
770			320950110593501	01/29/60	57	2367
771			320950110593501	01/30/61	60	2365
772			320950110593501	01/25/62	62	2362
773			320950110593501	02/04/63	65	2359
774			320950110593501	01/27/64	70	2354
775			320950110593501	02/02/65	68	2356
776			320950110593501	02/02/68	56	2368
777			320950110593501	02/09/70	82	2342
778			320950110593501	02/19/71	81	2343
779			320950110593501	02/01/72	85	2340
780			320950110593501	01/24/73	88	2336
781			320950110593501	01/15/74	86	2338
782			320950110593501	02/18/76	110	2314

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
783			320950110593501	02/01/77	116	2308
784			320950110593501	02/01/78	130	2295
785			320950110593501	02/01/79	127	2297
786			320950110593501	09/30/81	134	2290
787	D-14-13 35CDB	55-619915	320957110591801	09/15/31	32	2393
788		55-619915	320957110591801	11/16/31	31	2394
789		55-619915	320957110591801	12/15/31	29	2396
790		55-619915	320957110591801	01/16/32	29	2396
791		55-619915	320957110591801	02/15/32	29	2396
792		55-619915	320957110591801	05/01/32	30	2395
793		55-619915	320957110591801	06/01/32	32	2393
794		55-619915	320957110591801	07/01/32	31	2394
795		55-619915	320957110591801	08/01/32	30	2395
796		55-619915	320957110591801	09/01/32	32	2393
797		55-619915	320957110591801	10/01/32	32	2393
798		55-619915	320957110591801	11/01/32	31	2394
799		55-619915	320957110591801	05/01/33	31	2394
800		55-619915	320957110591801	07/01/33	32	2394
801		55-619915	320957110591801	01/01/34	30	2395
802		55-619915	320957110591801	04/01/34	31	2394
803		55-619915	320957110591801	07/01/34	35	2390
804		55-619915	320957110591801	10/01/34	34	2391
805		55-619915	320957110591801	02/01/35	32	2393
806		55-619915	320957110591801	03/01/35	31	2394
807		55-619915	320957110591801	04/01/35	33	2392
808		55-619915	320957110591801	06/01/35	34	2391
809		55-619915	320957110591801	04/01/36	32	2393
810		55-619915	320957110591801	07/17/36	35	2390
811		55-619915	320957110591801	02/24/37	32	2393
812		55-619915	320957110591801	04/23/37	34	2391
813		55-619915	320957110591801	07/15/37	35	2390
814		55-619915	320957110591801	08/19/37	35	2390
815		55-619915	320957110591801	09/16/37	37	2388
816		55-619915	320957110591801	10/13/37	35	2390

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
817		55-619915	320957110591801	11/17/37	35	2390
818		55-619915	320957110591801	12/21/37	34	2391
819		55-619915	320957110591801	01/18/38	35	2391
820		55-619915	320957110591801	02/17/38	34	2391
821		55-619915	320957110591801	03/16/38	34	2391
822		55-619915	320957110591801	04/14/38	34	2391
823		55-619915	320957110591801	05/16/38	36	2389
824		55-619915	320957110591801	03/01/40	34	2391
825		55-619915	320957110591801	10/01/40	37	2388
826		55-619915	320957110591801	01/01/41	34	2391
827		55-619915	320957110591801	10/13/49	58	2367
828		55-619915	320957110591801	02/09/50	54	2371
829		55-619915	320957110591801	02/05/52	57	2368
830		55-619915	320957110591801	02/09/54	63	2362
831		55-619915	320957110591801	02/10/55	56	2369
832		55-619915	320957110591801	02/15/56	50	2375
833		55-619915	320957110591801	02/07/57	56	2369
834		55-619915	320957110591801	01/28/58	58	2367
835		55-619915	320957110591801	01/30/59	58	2367
836		55-619915	320957110591801	01/01/60	59	2366
837		55-619915	320957110591801	01/27/61	63	2362
838		55-619915	320957110591801	01/24/62	65	2360
839		55-619915	320957110591801	01/28/63	68	2357
840		55-619915	320957110591801	01/27/64	73	2352
841		55-619915	320957110591801	02/02/65	71	2354
842		55-619915	320957110591801	06/09/65	76	2349
843		55-619915	320957110591801	08/13/65	79	2346
844		55-619915	320957110591801	09/27/65	79	2346
845		55-619915	320957110591801	10/15/65	79	2346
846		55-619915	320957110591801	12/15/65	76	2350
847		55-619915	320957110591801	01/15/66	72	2353
848		55-619915	320957110591801	03/04/66	69	2356
849		55-619915	320957110591801	03/17/66	70	2355
850		55-619915	320957110591801	01/05/67	70	2355

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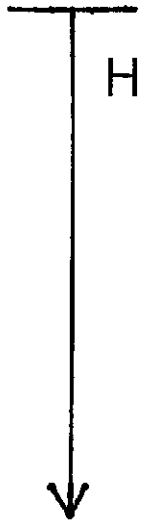
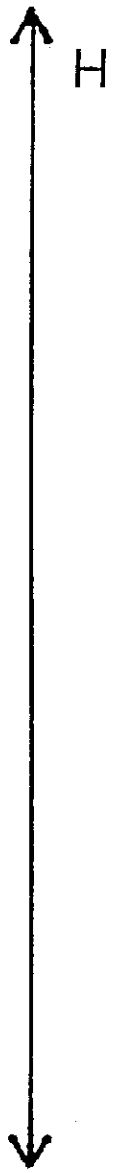
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
851		55-619915	320957110591801	02/01/67	69	2356
852		55-619915	320957110591801	07/20/67	77	2348
853		55-619915	320957110591801	08/28/67	76	2349
854		55-619915	320957110591801	09/01/67	78	2347
855		55-619915	320957110591801	10/25/67	79	2346
856		55-619915	320957110591801	02/02/68	76	2349
857		55-619915	320957110591801	02/14/69	76	2349
858		55-619915	320957110591801	04/23/70	84	2341
859		55-619915	320957110591801	01/05/82	135	2290
860		55-619915	320957110591801	12/01/82	141	2284
861		55-619915	320957110591801	01/09/84	127	2298
862		55-619915	320957110591801	01/08/85	111	2314
863		55-619915	320957110591801	12/30/85	111	2314
864		55-619915	320957110591801	01/02/87	110	2315
865		55-619915	320957110591801	12/30/87	115	2310
866		55-619915	320957110591801	01/09/89	124	2301
867		55-619915	320957110591801	12/28/90	131	2294
868		55-619915	320957110591801	12/23/91	135	2290
869		55-619915	320957110591801	12/16/93	139	2286
870	D-14-13 35CDC1	55-619914	320947110591801	03/16/31	31	2394
871		55-619914	320947110591801	04/15/31	32	2393
872		55-619914	320947110591801	05/15/31	32	2393
873		55-619914	320947110591801	06/16/31	34	2391
874		55-619914	320947110591801	07/15/31	34	2391
875		55-619914	320947110591801	08/17/31	31	2394
876		55-619914	320947110591801	09/15/31	31	2394
877		55-619914	320947110591801	10/15/31	31	2394
878		55-619914	320947110591801	11/16/31	30	2395
879		55-619914	320947110591801	12/15/31	28	2397
880		55-619914	320947110591801	01/16/32	28	2397
881		55-619914	320947110591801	02/15/32	28	2397
882		55-619914	320947110591801	03/15/32	28	2397
883		55-619914	320947110591801	04/01/32	29	2396
884		55-619914	320947110591801	05/01/32	29	2396



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
885		55-619914	320947110591801	06/01/32	31	2394
886		55-619914	320947110591801	07/01/32	31	2394
887		55-619914	320947110591801	08/01/32	30	2395
888		55-619914	320947110591801	09/01/32	31	2394
889		55-619914	320947110591801	10/01/32	32	2393
890		55-619914	320947110591801	11/01/32	31	2394
891		55-619914	320947110591801	12/01/32	30	2395
892		55-619914	320947110591801	02/01/33	29	2396
893		55-619914	320947110591801	03/01/33	30	2395
894		55-619914	320947110591801	04/01/33	30	2395
895		55-619914	320947110591801	05/01/33	30	2395
896		55-619914	320947110591801	06/01/33	31	2394
897		55-619914	320947110591801	07/01/33	31	2394
898		55-619914	320947110591801	11/01/33	31	2394
899		55-619914	320947110591801	12/01/33	31	2394
900		55-619914	320947110591801	01/01/34	30	2395
901		55-619914	320947110591801	02/01/34	30	2395
902		55-619914	320947110591801	03/01/34	31	2394
903		55-619914	320947110591801	04/01/34	31	2394
904		55-619914	320947110591801	05/01/34	32	2393
905		55-619914	320947110591801	06/01/34	33	2392
906		55-619914	320947110591801	07/01/34	34	2391
907		55-619914	320947110591801	08/01/34	34	2392
908		55-619914	320947110591801	10/01/34	34	2391
909		55-619914	320947110591801	11/01/34	34	2391
910		55-619914	320947110591801	12/01/34	32	2393
911		55-619914	320947110591801	02/01/35	31	2394
912		55-619914	320947110591801	03/01/35	31	2394
913		55-619914	320947110591801	04/01/35	33	2392
914		55-619914	320947110591801	06/01/35	34	2392
915		55-619914	320947110591801	09/01/35	33	2392
916		55-619914	320947110591801	10/01/35	33	2392
917		55-619914	320947110591801	12/01/35	31	2394
918		55-619914	320947110591801	01/21/36	31	2394



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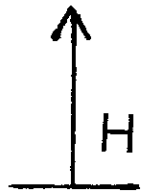
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
919		55-619914	320947110591801	04/01/36	31	2394
920		55-619914	320947110591801	07/17/36	34	2391
921		55-619914	320947110591801	01/12/37	32	2393
922		55-619914	320947110591801	02/24/37	32	2393
923		55-619914	320947110591801	04/23/37	33	2392
924		55-619914	320947110591801	06/10/37	34	2391
925		55-619914	320947110591801	07/15/37	34	2391
926		55-619914	320947110591801	08/19/37	35	2390
927		55-619914	320947110591801	10/13/37	35	2390
928		55-619914	320947110591801	11/17/37	34	2391
929		55-619914	320947110591801	12/21/37	33	2392
930		55-619914	320947110591801	01/18/38	33	2392
931		55-619914	320947110591801	02/17/38	31	2394
932		55-619914	320947110591801	04/14/38	32	2393
933		55-619914	320947110591801	06/16/38	37	2388
934		55-619914	320947110591801	10/01/38	36	2389
935		55-619914	320947110591801	11/01/38	36	2389
936		55-619914	320947110591801	01/01/39	40	2385
937		55-619914	320947110591801	03/01/40	33	2392
938		55-619914	320947110591801	06/25/46	51	2374
939		55-619914	320947110591801	02/28/47	46	2379
940		55-619914	320947110591801	10/28/47	50	2375
941		55-619914	320947110591801	02/23/48	48	2377
942		55-619914	320947110591801	06/18/48	56	2369
943		55-619914	320947110591801	10/14/48	55	2370
944		55-619914	320947110591801	02/10/49	49	2376
945		55-619914	320947110591801	06/29/49	58	2367
946		55-619914	320947110591801	10/13/49	57	2368
947		55-619914	320947110591801	02/09/50	54	2371
948		55-619914	320947110591801	11/06/50	58	2367
949		55-619914	320947110591801	02/23/51	54	2371
950		55-619914	320947110591801	07/13/51	65	2360
951		55-619914	320947110591801	02/05/52	56	2369
952		55-619914	320947110591801	02/06/53	61	2364

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
953		55-619914	320947110591801	02/08/54	60	2365
954		55-619914	320947110591801	12/30/96	167	2259
955		55-619914	320947110591801	02/10/98	172	2253
956		55-619914	320947110591801	12/24/98	177	2248
957		55-619914	320947110591801	12/29/99	180	2245
958	D-14-13 35DAD	55-620146	321000110584901	12/28/81	160	2292
959		55-620146	321000110584901	12/01/82	166	2285
960		55-620146	321000110584901	01/06/84	152	2299
961		55-620146	321000110584901	01/07/85	138	2313
962		55-620146	321000110584901	07/09/85	146	2305
963		55-620146	321000110584901	10/10/85	149	2302
964		55-620146	321000110584901	12/30/85	136	2315
965		55-620146	321000110584901	02/20/86	140	2311
966		55-620146	321000110584901	05/20/86	142	2309
967		55-620146	321000110584901	08/26/86	147	2304
968		55-620146	321000110584901	11/17/86	146	2305
969		55-620146	321000110584901	01/02/87	136	2315
970		55-620146	321000110584901	02/23/87	142	2309
971		55-620146	321000110584901	05/26/87	145	2306
972		55-620146	321000110584901	12/23/87	142	2309
973		55-620146	321000110584901	01/09/89	150	2301
974		55-620146	321000110584901	12/23/91	161	2290
975		55-620146	321000110584901	01/21/94	164	2287
976		55-620146	321000110584901	01/10/95	172	2279
977		55-620146	321000110584901	12/19/96	187	2264
978		55-620146	321000110584901	02/10/98	206	2245
979		55-620146	321000110584901	01/19/99	209	2242
980		55-620146	321000110584901	12/29/99	207	2244
981	D-14-13 35DCB	55-619924	320958110590201	01/05/82	152	2283
982		55-619924	320958110590201	12/01/82	158	2277
983		55-619924	320958110590201	01/09/84	144	2291
984		55-619924	320958110590201	01/07/85	130	2305
985		55-619924	320958110590201	10/10/85	142	2293
986		55-619924	320958110590201	12/30/85	128	2307



Arizona Department of Water Resources
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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
987		55-619924	320958110590201	05/20/86	136	2299
988		55-619924	320958110590201	11/17/86	139	2296
989		55-619924	320958110590201	01/02/87	127	2308
990		55-619924	320958110590201	12/30/87	133	2302
991		55-619924	320958110590201	01/09/89	142	2293
992		55-619924	320958110590201	12/28/90	149	2286
993		55-619924	320958110590201	12/23/91	152	2283
994		55-619924	320958110590201	01/21/94	155	2280
995		55-619924	320958110590201	01/10/95	163	2272
996		55-619924	320958110590201	12/19/96	187	2248
997		55-619924	320958110590201	02/10/98	194	2241
998		55-619924	320958110590201	01/19/99	198	2237
999		55-619924	320958110590201	12/29/99	198	2237
1000	D-14-13 35DDA	55-533858	320954110584201	04/27/98	230	2224
1001		55-533858	320954110584201	11/10/98	201	2252
1002		55-533858	320954110584201	12/27/99	208	2245
1003	D-14-13 35DDB1	55-533856	320957110585101	11/09/98	200	2248
1004		55-533856	320957110585101	12/27/99	203	2245
1005	D-14-13 35DDB2	55-533857	320956110584901	04/24/98	228	2220
1006		55-533857	320956110584901	05/08/98	223	2225
1007		55-533857	320956110584901	11/09/98	200	2248
1008		55-533857	320956110584901	12/27/99	204	2244
1009	D-15-13 11AAB	55-507256	320853110584601	07/10/85	151	2329
1010		55-507256	320853110584601	07/10/85	168	2312
1011		55-507256	320853110584601	10/09/85	151	2329
1012		55-507256	320853110584601	02/18/86	146	2334
1013		55-507256	320853110584601	02/18/86	164	2316
1014		55-507256	320853110584601	05/19/86	146	2334
1015		55-507256	320853110584601	05/19/86	163	2318
1016		55-507256	320853110584601	08/26/86	150	2330
1017		55-507256	320853110584601	08/26/86	166	2314
1018		55-507256	320853110584601	11/19/86	149	2331
1019		55-507256	320853110584601	11/19/86	166	2314
1020		55-507256	320853110584601	12/23/86	148	2333

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1021		55-507256	320853110584601	02/24/87	146	2334
1022		55-507256	320853110584601	02/24/87	164	2316
1023		55-507256	320853110584601	05/26/87	147	2333
1024		55-507256	320853110584601	05/26/87	165	2315
1025		55-507256	320853110584601	11/17/87	152	2328
1026		55-507256	320853110584601	11/17/87	169	2311
1027		55-507256	320853110584601	12/21/87	153	2327
1028		55-507256	320853110584601	03/01/88	142	2338
1029		55-507256	320853110584601	03/01/88	170	2310
1030		55-507256	320853110584601	03/01/88	170	2310
1031		55-507256	320853110584601	03/01/88	142	2338
1032		55-507256	320853110584601	05/25/88	155	2325
1033		55-507256	320853110584601	05/25/88	172	2308
1034		55-507256	320853110584601	08/10/88	158	2322
1035		55-507256	320853110584601	08/10/88	176	2304
1036		55-507256	320853110584601	10/19/88	159	2321
1037		55-507256	320853110584601	10/19/88	176	2304
1038		55-507256	320853110584601	01/23/89	159	2321
1039		55-507256	320853110584601	01/23/89	178	2302
1040		55-507256	320853110584601	04/24/89	162	2318
1041		55-507256	320853110584601	04/24/89	177	2303
1042		55-507256	320853110584601	02/25/92	172	2308
1043		55-507256	320853110584601	02/01/94	174	2306
1044		55-507256	320853110584601	01/30/95	177	2303
1045	D-15-13 11AAD1	55-505575	320846110583801	10/09/85	152	2329
1046		55-505575	320846110583801	10/09/85	156	2325
1047		55-505575	320846110583801	05/21/86	149	2332
1048		55-505575	320846110583801	05/21/86	152	2329
1049		55-505575	320846110583801	11/18/86	151	2330
1050		55-505575	320846110583801	11/18/86	154	2327
1051		55-505575	320846110583801	12/23/86	150	2332
1052		55-505575	320846110583801	11/16/87	156	2326
1053		55-505575	320846110583801	11/16/87	159	2322
1054		55-505575	320846110583801	12/21/87	155	2326

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1055		55-505575	320846110583801	05/23/88	160	2322
1056		55-505575	320846110583801	05/23/88	163	2319
1057		55-505575	320846110583801	10/17/88	164	2317
1058		55-505575	320846110583801	10/17/88	167	2315
1059		55-505575	320846110583801	02/25/92	174	2307
1060		55-505575	320846110583801	02/01/94	171	2310
1061		55-505575	320846110583801	01/10/95	180	2302
1062		55-505575	320846110583801	12/30/96	196	2285
1063		55-505575	320846110583801	02/25/97	196	2285
1064		55-505575	320846110583801	12/24/97	202	2280
1065		55-505575	320846110583801	12/27/99	211	2271
1066	D-15-13 11AAD2	55-505576	320845110583801	07/11/85	100	2382
1067		55-505576	320845110583801	07/11/85	118	2365
1068		55-505576	320845110583801	10/09/85	99	2383
1069		55-505576	320845110583801	10/09/85	117	2366
1070		55-505576	320845110583801	02/19/86	99	2383
1071		55-505576	320845110583801	02/19/86	120	2362
1072		55-505576	320845110583801	05/21/86	100	2382
1073		55-505576	320845110583801	05/21/86	118	2364
1074		55-505576	320845110583801	08/27/86	100	2382
1075		55-505576	320845110583801	08/27/86	118	2364
1076		55-505576	320845110583801	11/18/86	100	2382
1077		55-505576	320845110583801	11/18/86	118	2364
1078		55-505576	320845110583801	12/23/86	99	2383
1079		55-505576	320845110583801	02/24/87	99	2383
1080		55-505576	320845110583801	02/24/87	117	2366
1081		55-505576	320845110583801	05/24/87	118	2364
1082		55-505576	320845110583801	05/25/87	101	2381
1083		55-505576	320845110583801	11/16/87	101	2381
1084		55-505576	320845110583801	11/16/87	118	2364
1085		55-505576	320845110583801	12/21/87	100	2382
1086		55-505576	320845110583801	03/01/88	102	2381
1087		55-505576	320845110583801	03/01/88	118	2364
1088		55-505576	320845110583801	03/01/88	119	2364

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1089		55-505576	320845110583801	03/01/88	102	2381
1090		55-505576	320845110583801	05/23/88	102	2381
1091		55-505576	320845110583801	05/23/88	119	2364
1092		55-505576	320845110583801	08/10/88	102	2380
1093		55-505576	320845110583801	08/10/88	118	2364
1094		55-505576	320845110583801	10/17/88	102	2380
1095		55-505576	320845110583801	10/17/88	118	2364
1096		55-505576	320845110583801	01/23/89	102	2380
1097		55-505576	320845110583801	01/23/89	118	2364
1098		55-505576	320845110583801	04/24/89	103	2379
1099		55-505576	320845110583801	04/24/89	119	2363
1100		55-505576	320845110583801	02/25/92	101	2381
1101		55-505576	320845110583801	02/01/94	100	2383
1102		55-505576	320845110583801	01/10/95	105	2377
1103		55-505576	320845110583801	12/30/96	115	2367
1104		55-505576	320845110583801	02/25/97	114	2368
1105		55-505576	320845110583801	12/24/97	115	2368
1106		55-505576	320845110583801	12/27/99	106	2376
1107	D-15-13 11ADB	55-620160	320837110585001	02/05/59	64	2417
1108		55-620160	320837110585001	02/08/60	65	2415
1109		55-620160	320837110585001	02/02/61	65	2415
1110		55-620160	320837110585001	02/01/62	98	2382
1111		55-620160	320837110585001	02/13/63	104	2376
1112		55-620160	320837110585001	02/06/64	111	2369
1113		55-620160	320837110585001	02/05/65	109	2371
1114		55-620160	320837110585001	04/25/66	109	2371
1115		55-620160	320837110585001	11/02/66	110	2370
1116		55-620160	320837110585001	01/26/67	110	2371
1117		55-620160	320837110585001	11/01/67	117	2363
1118		55-620160	320837110585001	11/01/68	119	2361
1119		55-620160	320837110585001	12/28/81	147	2333
1120		55-620160	320837110585001	12/01/82	140	2340
1121		55-620160	320837110585001	01/05/84	149	2331
1122		55-620160	320837110585001	01/04/85	157	2323

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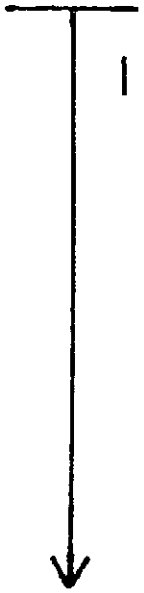
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1123		55-620160	320837110585001	01/10/86	102	2378
1124		55-620160	320837110585001	12/31/87	142	2338
1125		55-620160	320837110585001	01/17/89	147	2334
1126		55-620160	320837110585001	01/08/91	139	2341
1127		55-620160	320837110585001	02/28/92	138	2342
1128		55-620160	320837110585001	12/17/93	113	2367
1129		55-620160	320837110585001	02/01/95	127	2353
1130		55-620160	320837110585001	12/19/96	122	2358
1131		55-620160	320837110585001	02/11/98	123	2357
1132		55-620160	320837110585001	12/23/98	124	2356
1133		55-620160	320837110585001	12/28/99	114	2366
1134	D-15-13 11ADC	55-801435	320828110585201	12/22/81	101	2384
1135		55-801435	320828110585201	01/05/84	93	2392
1136		55-801435	320828110585201	12/01/87	94	2391
1137		55-801435	320828110585201	01/17/95	97	2388
1138		55-801435	320828110585201	02/28/00	89	2397
1139	D-15-13 11BAA	55-807326	320850110591201	05/01/62	65	2400
1140	D-15-13 11CBA	55-619918	320824110593001	07/15/31	37	2421
1141		55-619918	320824110593001	09/15/31	33	2425
1142		55-619918	320824110593001	11/16/31	33	2425
1143		55-619918	320824110593001	12/15/31	31	2426
1144		55-619918	320824110593001	01/16/32	31	2426
1145		55-619918	320824110593001	02/15/32	31	2427
1146		55-619918	320824110593001	03/15/32	31	2427
1147		55-619918	320824110593001	05/01/32	32	2426
1148		55-619918	320824110593001	06/01/32	32	2425
1149		55-619918	320824110593001	08/01/32	33	2424
1150		55-619918	320824110593001	10/01/32	34	2424
1151		55-619918	320824110593001	11/01/32	34	2424
1152		55-619918	320824110593001	12/01/32	34	2424
1153		55-619918	320824110593001	02/01/33	33	2425
1154		55-619918	320824110593001	03/01/33	33	2424
1155		55-619918	320824110593001	04/01/33	34	2424
1156		55-619918	320824110593001	05/01/33	34	2424



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1157		55-619918	320824110593001	11/01/33	34	2423
1158		55-619918	320824110593001	12/01/33	34	2424
1159		55-619918	320824110593001	01/01/34	34	2424
1160		55-619918	320824110593001	02/01/34	34	2424
1161		55-619918	320824110593001	03/01/34	34	2424
1162		55-619918	320824110593001	05/01/34	35	2422
1163		55-619918	320824110593001	07/01/34	36	2421
1164		55-619918	320824110593001	08/01/34	36	2422
1165		55-619918	320824110593001	10/01/34	36	2422
1166		55-619918	320824110593001	11/01/34	36	2421
1167		55-619918	320824110593001	12/01/34	36	2422
1168		55-619918	320824110593001	01/01/35	35	2423
1169		55-619918	320824110593001	02/01/35	34	2423
1170		55-619918	320824110593001	03/01/35	34	2423
1171		55-619918	320824110593001	04/01/35	35	2423
1172		55-619918	320824110593001	08/01/35	36	2422
1173		55-619918	320824110593001	12/01/35	36	2422
1174		55-619918	320824110593001	01/21/36	36	2422
1175		55-619918	320824110593001	01/01/37	35	2423
1176		55-619918	320824110593001	02/24/37	34	2423
1177		55-619918	320824110593001	04/23/37	34	2423
1178		55-619918	320824110593001	07/15/37	37	2420
1179		55-619918	320824110593001	08/19/37	38	2419
1180		55-619918	320824110593001	09/16/37	38	2419
1181		55-619918	320824110593001	10/13/37	37	2421
1182		55-619918	320824110593001	11/17/37	37	2421
1183		55-619918	320824110593001	12/21/37	36	2421
1184		55-619918	320824110593001	01/18/38	36	2421
1185		55-619918	320824110593001	02/17/38	36	2422
1186		55-619918	320824110593001	03/16/38	36	2422
1187		55-619918	320824110593001	04/14/38	37	2421
1188		55-619918	320824110593001	05/16/38	40	2418
1189		55-619918	320824110593001	06/16/38	38	2419
1190		55-619918	320824110593001	08/18/38	38	2420

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1191		55-619918	320824110593001	10/01/38	39	2419
1192		55-619918	320824110593001	11/01/38	38	2420
1193		55-619918	320824110593001	12/01/38	37	2420
1194		55-619918	320824110593001	01/01/39	37	2421
1195		55-619918	320824110593001	02/01/39	36	2421
1196		55-619918	320824110593001	04/01/39	37	2420
1197		55-619918	320824110593001	05/01/39	38	2419
1198		55-619918	320824110593001	07/01/39	39	2419
1199		55-619918	320824110593001	08/01/39	36	2421
1200		55-619918	320824110593001	11/01/39	37	2420
1201		55-619918	320824110593001	01/01/40	35	2422
1202		55-619918	320824110593001	02/01/40	36	2421
1203		55-619918	320824110593001	03/01/40	39	2419
1204		55-619918	320824110593001	10/01/40	40	2417
1205		55-619918	320824110593001	06/25/46	46	2412
1206		55-619918	320824110593001	02/28/47	44	2413
1207		55-619918	320824110593001	06/12/47	47	2411
1208		55-619918	320824110593001	10/28/47	47	2411
1209		55-619918	320824110593001	02/23/48	46	2411
1210		55-619918	320824110593001	06/26/48	49	2408
1211		55-619918	320824110593001	10/15/48	49	2409
1212		55-619918	320824110593001	02/07/49	48	2409
1213		55-619918	320824110593001	06/29/49	53	2405
1214		55-619918	320824110593001	10/13/49	52	2405
1215		55-619918	320824110593001	02/09/50	50	2407
1216		55-619918	320824110593001	11/07/50	52	2405
1217		55-619918	320824110593001	02/26/51	52	2406
1218		55-619918	320824110593001	07/13/51	59	2398
1219		55-619918	320824110593001	02/08/52	54	2404
1220		55-619918	320824110593001	02/09/53	58	2399
1221		55-619918	320824110593001	02/09/54	62	2395
1222		55-619918	320824110593001	02/14/55	59	2399
1223		55-619918	320824110593001	02/13/56	51	2406
1224		55-619918	320824110593001	02/09/57	62	2395

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1225		55-619918	320824110593001	01/29/58	61	2397
1226		55-619918	320824110593001	02/02/59	63	2394
1227		55-619918	320824110593001	02/01/60	65	2393
1228		55-619918	320824110593001	01/30/61	70	2388
1229		55-619918	320824110593001	01/30/62	72	2386
1230		55-619918	320824110593001	01/28/63	77	2380
1231		55-619918	320824110593001	01/29/64	83	2374
1232		55-619918	320824110593001	02/05/65	83	2375
1233		55-619918	320824110593001	06/11/65	86	2371
1234		55-619918	320824110593001	08/06/65	88	2369
1235		55-619918	320824110593001	09/27/65	89	2369
1236		55-619918	320824110593001	10/15/65	90	2367
1237		55-619918	320824110593001	12/15/65	88	2370
1238		55-619918	320824110593001	01/15/66	85	2372
1239		55-619918	320824110593001	03/17/66	82	2376
1240		55-619918	320824110593001	04/19/66	84	2374
1241		55-619918	320824110593001	01/01/67	81	2377
1242		55-619918	320824110593001	02/01/67	79	2378
1243		55-619918	320824110593001	03/01/67	81	2376
1244		55-619918	320824110593001	10/25/67	89	2368
1245		55-619918	320824110593001	01/22/68	84	2374
1246		55-619918	320824110593001	02/21/68	83	2374
1247		55-619918	320824110593001	03/22/68	84	2374
1248		55-619918	320824110593001	04/22/68	85	2373
1249		55-619918	320824110593001	05/22/68	85	2372
1250		55-619918	320824110593001	06/20/68	87	2370
1251		55-619918	320824110593001	07/19/68	90	2368
1252		55-619918	320824110593001	08/22/68	89	2368
1253		55-619918	320824110593001	09/23/68	90	2367
1254		55-619918	320824110593001	10/23/68	89	2368
1255		55-619918	320824110593001	11/21/68	88	2369
1256		55-619918	320824110593001	12/24/68	88	2370
1257		55-619918	320824110593001	01/24/69	87	2370
1258		55-619918	320824110593001	02/26/69	88	2369

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1259		55-619918	320824110593001	03/25/69	92	2366
1260		55-619918	320824110593001	04/25/69	92	2366
1261		55-619918	320824110593001	05/23/69	93	2364
1262		55-619918	320824110593001	06/25/69	95	2362
1263		55-619918	320824110593001	07/24/69	97	2361
1264		55-619918	320824110593001	08/22/69	97	2360
1265		55-619918	320824110593001	09/23/69	98	2359
1266		55-619918	320824110593001	10/24/69	98	2360
1267		55-619918	320824110593001	11/25/69	96	2362
1268		55-619918	320824110593001	12/23/69	95	2363
1269		55-619918	320824110593001	01/23/70	94	2363
1270		55-619918	320824110593001	02/19/70	94	2364
1271		55-619918	320824110593001	03/20/70	94	2364
1272		55-619918	320824110593001	04/21/70	95	2362
1273		55-619918	320824110593001	05/25/70	97	2360
1274		55-619918	320824110593001	06/25/70	99	2359
1275		55-619918	320824110593001	07/27/70	99	2358
1276		55-619918	320824110593001	08/26/70	100	2357
1277		55-619918	320824110593001	09/24/70	100	2358
1278		55-619918	320824110593001	10/28/70	99	2358
1279		55-619918	320824110593001	11/24/70	99	2359
1280		55-619918	320824110593001	12/28/70	98	2359
1281		55-619918	320824110593001	01/26/71	97	2361
1282		55-619918	320824110593001	02/25/71	96	2361
1283		55-619918	320824110593001	03/25/71	97	2361
1284		55-619918	320824110593001	04/26/71	98	2359
1285		55-619918	320824110593001	05/24/71	100	2357
1286		55-619918	320824110593001	06/24/71	101	2356
1287		55-619918	320824110593001	07/26/71	103	2355
1288		55-619918	320824110593001	08/24/71	104	2354
1289		55-619918	320824110593001	09/27/71	102	2355
1290		55-619918	320824110593001	10/26/71	104	2354
1291		55-619918	320824110593001	11/23/71	101	2356
1292		55-619918	320824110593001	12/21/71	101	2357

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1293		55-619918	320824110593001	01/24/72	100	2358
1294		55-619918	320824110593001	02/22/72	100	2357
1295		55-619918	320824110593001	03/22/72	102	2356
1296		55-619918	320824110593001	04/27/72	104	2353
1297		55-619918	320824110593001	05/25/72	106	2352
1298		55-619918	320824110593001	06/27/72	107	2350
1299		55-619918	320824110593001	07/26/72	109	2348
1300		55-619918	320824110593001	08/25/72	110	2347
1301		55-619918	320824110593001	09/25/72	111	2346
1302		55-619918	320824110593001	10/26/72	111	2347
1303		55-619918	320824110593001	11/27/72	109	2348
1304		55-619918	320824110593001	12/21/72	109	2349
1305		55-619918	320824110593001	01/24/73	110	2348
1306		55-619918	320824110593001	02/27/73	110	2347
1307		55-619918	320824110593001	03/21/73	110	2348
1308		55-619918	320824110593001	04/26/73	110	2347
1309		55-619918	320824110593001	05/29/73	112	2345
1310		55-619918	320824110593001	06/25/73	113	2344
1311		55-619918	320824110593001	07/24/73	115	2342
1312		55-619918	320824110593001	08/28/73	118	2340
1313		55-619918	320824110593001	09/26/73	119	2338
1314		55-619918	320824110593001	10/25/73	120	2337
1315		55-619918	320824110593001	11/26/73	120	2337
1316		55-619918	320824110593001	12/20/73	120	2337
1317		55-619918	320824110593001	01/28/74	119	2338
1318		55-619918	320824110593001	02/25/74	119	2339
1319		55-619918	320824110593001	03/26/74	120	2338
1320		55-619918	320824110593001	04/26/74	122	2336
1321		55-619918	320824110593001	05/22/74	123	2334
1322		55-619918	320824110593001	07/24/74	128	2330
1323		55-619918	320824110593001	08/26/74	130	2328
1324		55-619918	320824110593001	09/26/74	131	2326
1325		55-619918	320824110593001	10/22/74	131	2327
1326		55-619918	320824110593001	11/26/74	131	2327

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1327		55-619918	320824110593001	12/23/74	129	2328
1328		55-619918	320824110593001	01/27/75	129	2329
1329		55-619918	320824110593001	02/24/75	129	2328
1330		55-619918	320824110593001	03/24/75	130	2327
1331		55-619918	320824110593001	04/22/75	132	2326
1332		55-619918	320824110593001	05/22/75	131	2327
1333		55-619918	320824110593001	06/23/75	134	2324
1334		55-619918	320824110593001	08/25/75	136	2321
1335		55-619918	320824110593001	09/25/75	137	2321
1336		55-619918	320824110593001	10/28/75	138	2320
1337		55-619918	320824110593001	11/24/75	138	2320
1338		55-619918	320824110593001	12/22/75	138	2320
1339		55-619918	320824110593001	01/27/76	137	2320
1340		55-619918	320824110593001	02/23/76	137	2320
1341		55-619918	320824110593001	03/25/76	138	2320
1342		55-619918	320824110593001	04/22/76	138	2320
1343		55-619918	320824110593001	05/26/76	138	2319
1344		55-619918	320824110593001	06/24/76	139	2318
1345		55-619918	320824110593001	07/26/76	141	2316
1346		55-619918	320824110593001	08/25/76	141	2316
1347		55-619918	320824110593001	09/22/76	142	2316
1348		55-619918	320824110593001	11/24/76	142	2316
1349		55-619918	320824110593001	12/23/76	141	2316
1350		55-619918	320824110593001	01/02/77	141	2316
1351		55-619918	320824110593001	01/25/77	140	2317
1352		55-619918	320824110593001	02/23/77	135	2322
1353		55-619918	320824110593001	03/28/77	139	2318
1354		55-619918	320824110593001	04/27/77	140	2318
1355		55-619918	320824110593001	05/25/77	142	2316
1356		55-619918	320824110593001	06/28/77	142	2315
1357		55-619918	320824110593001	07/28/77	143	2315
1358		55-619918	320824110593001	08/26/77	144	2314
1359		55-619918	320824110593001	09/23/77	144	2313
1360		55-619918	320824110593001	10/27/77	144	2313

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1361		55-619918	320824110593001	11/28/77	144	2314
1362		55-619918	320824110593001	12/21/77	144	2314
1363		55-619918	320824110593001	01/25/78	147	2311
1364		55-619918	320824110593001	02/23/78	144	2314
1365		55-619918	320824110593001	03/21/78	141	2316
1366		55-619918	320824110593001	04/21/78	146	2311
1367		55-619918	320824110593001	05/25/78	140	2317
1368		55-619918	320824110593001	06/23/78	141	2317
1369		55-619918	320824110593001	07/25/78	143	2315
1370		55-619918	320824110593001	08/28/78	144	2313
1371		55-619918	320824110593001	09/25/78	146	2312
1372		55-619918	320824110593001	10/26/78	146	2311
1373		55-619918	320824110593001	11/22/78	147	2310
1374		55-619918	320824110593001	12/26/78	148	2310
1375		55-619918	320824110593001	01/24/79	145	2312
1376		55-619918	320824110593001	02/22/79	140	2317
1377		55-619918	320824110593001	03/26/79	138	2319
1378		55-619918	320824110593001	04/23/79	138	2320
1379		55-619918	320824110593001	05/23/79	136	2321
1380		55-619918	320824110593001	06/25/79	139	2319
1381		55-619918	320824110593001	07/24/79	140	2318
1382		55-619918	320824110593001	08/24/79	141	2317
1383		55-619918	320824110593001	09/24/79	142	2315
1384		55-619918	320824110593001	10/23/79	154	2304
1385		55-619918	320824110593001	10/25/79	144	2314
1386		55-619918	320824110593001	11/21/79	143	2314
1387		55-619918	320824110593001	12/20/79	142	2315
1388		55-619918	320824110593001	01/24/80	141	2317
1389		55-619918	320824110593001	02/22/80	140	2317
1390		55-619918	320824110593001	03/25/80	139	2318
1391		55-619918	320824110593001	04/24/80	140	2318
1392		55-619918	320824110593001	05/25/80	140	2318
1393		55-619918	320824110593001	06/24/80	141	2317
1394		55-619918	320824110593001	07/25/80	142	2315

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1395		55-619918	320824110593001	08/26/80	144	2314
1396		55-619918	320824110593001	09/22/80	145	2313
1397		55-619918	320824110593001	10/24/80	148	2309
1398		55-619918	320824110593001	11/24/80	145	2313
1399		55-619918	320824110593001	12/23/80	144	2313
1400		55-619918	320824110593001	01/27/81	145	2312
1401		55-619918	320824110593001	02/24/81	143	2314
1402		55-619918	320824110593001	03/25/81	143	2314
1403		55-619918	320824110593001	04/24/81	144	2313
1404		55-619918	320824110593001	05/22/81	145	2313
1405		55-619918	320824110593001	06/25/81	148	2309
1406		55-619918	320824110593001	07/30/81	150	2308
1407		55-619918	320824110593001	08/27/81	150	2308
1408		55-619918	320824110593001	09/24/81	148	2309
1409		55-619918	320824110593001	10/27/81	151	2306
1410		55-619918	320824110593001	11/25/81	155	2303
1411		55-619918	320824110593001	12/28/81	155	2302
1412		55-619918	320824110593001	01/04/82	149	2308
1413		55-619918	320824110593001	01/28/82	152	2306
1414		55-619918	320824110593001	02/24/82	150	2307
1415		55-619918	320824110593001	03/29/82	151	2307
1416		55-619918	320824110593001	04/27/82	151	2306
1417		55-619918	320824110593001	12/30/83	146	2312
1418		55-619918	320824110593001	12/30/84	130	2328
1419		55-619918	320824110593001	01/13/86	124	2334
1420		55-619918	320824110593001	12/23/86	124	2334
1421		55-619918	320824110593001	12/30/87	128	2330
1422		55-619918	320824110593001	01/04/89	134	2323
1423		55-619918	320824110593001	01/09/91	141	2316
1424		55-619918	320824110593001	12/26/91	145	2313
1425		55-619918	320824110593001	12/16/93	146	2311
1426		55-619918	320824110593001	02/01/95	149	2308
1427		55-619918	320824110593001	12/19/96	162	2295
1428		55-619918	320824110593001	02/11/98	169	2289

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1429		55-619918	320824110593001	12/24/98	173	2285
1430		55-619918	320824110593001	12/28/99	177	2280
1431	D-15-13 11DDB1	55-619969	320815110585201	06/04/52	54	2436
1432		55-619969	320815110585201	02/09/53	56	2434
1433		55-619969	320815110585201	02/11/54	56	2434
1434		55-619969	320815110585201	02/10/55	55	2435
1435		55-619969	320815110585201	02/13/56	54	2436
1436		55-619969	320815110585201	02/15/57	55	2435
1437		55-619969	320815110585201	02/05/58	55	2435
1438		55-619969	320815110585201	02/05/59	57	2433
1439		55-619969	320815110585201	02/08/60	58	2432
1440		55-619969	320815110585201	02/02/61	59	2431
1441		55-619969	320815110585201	02/02/62	59	2431
1442		55-619969	320815110585201	02/05/63	60	2430
1443		55-619969	320815110585201	02/06/64	61	2429
1444		55-619969	320815110585201	02/05/65	61	2429
1445		55-619969	320815110585201	04/25/66	65	2425
1446		55-619969	320815110585201	11/02/66	62	2428
1447		55-619969	320815110585201	01/26/67	62	2428
1448		55-619969	320815110585201	11/01/67	62	2428
1449		55-619969	320815110585201	02/06/68	60	2430
1450		55-619969	320815110585201	12/22/81	67	2423
1451		55-619969	320815110585201	12/01/82	67	2423
1452		55-619969	320815110585201	01/05/84	65	2425
1453		55-619969	320815110585201	01/04/85	66	2424
1454		55-619969	320815110585201	01/09/86	54	2436
1455		55-619969	320815110585201	12/21/87	64	2426
1456		55-619969	320815110585201	01/08/91	65	2425
1457		55-619969	320815110585201	01/21/94	66	2424
1458		55-619969	320815110585201	02/01/95	65	2425
1459		55-619969	320815110585201	12/19/96	67	2423
1460		55-619969	320815110585201	02/11/98	67	2423
1461		55-619969	320815110585201	12/23/98	67	2423
1462		55-619969	320815110585201	12/28/99	68	2422

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1463	D-15-13 11DDB2	55-619970	320810110585001	02/10/55	65	2426
1464		55-619970	320810110585001	02/13/56	61	2430
1465		55-619970	320810110585001	02/07/57	61	2430
1466		55-619970	320810110585001	02/05/58	61	2430
1467		55-619970	320810110585001	02/05/59	59	2432
1468		55-619970	320810110585001	02/08/60	58	2433
1469		55-619970	320810110585001	02/02/61	94	2397
1470		55-619970	320810110585001	01/30/62	101	2391
1471		55-619970	320810110585001	02/05/63	107	2384
1472		55-619970	320810110585001	02/06/64	113	2378
1473		55-619970	320810110585001	02/05/65	113	2378
1474		55-619970	320810110585001	11/01/68	123	2368
1475		55-619970	320810110585001	11/01/69	124	2367
1476		55-619970	320810110585001	12/01/70	129	2362
1477		55-619970	320810110585001	01/17/72	130	2361
1478		55-619970	320810110585001	01/04/73	141	2350
1479		55-619970	320810110585001	12/26/73	146	2345
1480		55-619970	320810110585001	12/11/74	159	2332
1481		55-619970	320810110585001	12/01/76	168	2324
1482		55-619970	320810110585001	01/01/77	171	2320
1483		55-619970	320810110585001	12/22/81	172	2319
1484		55-619970	320810110585001	12/01/82	174	2317
1485		55-619970	320810110585001	01/04/85	157	2334
1486		55-619970	320810110585001	01/05/85	165	2326
1487		55-619970	320810110585001	01/09/86	146	2345
1488		55-619970	320810110585001	12/23/86	148	2343
1489		55-619970	320810110585001	12/21/87	152	2339
1490		55-619970	320810110585001	12/17/88	157	2334
1491		55-619970	320810110585001	01/08/91	157	2334
1492		55-619970	320810110585001	01/21/94	156	2335
1493		55-619970	320810110585001	02/01/95	156	2335
1494		55-619970	320810110585001	12/19/96	165	2326
1495		55-619970	320810110585001	02/11/98	168	2323
1496		55-619970	320810110585001	12/23/98	169	2322

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1497		55-619970	320810110585001	12/28/99	170	2321
1498	D-15-13 11DDC		320805110585001	06/16/72	144	2357
1499	D-15-13 14ACA		320746110585601	02/09/53	52	2438
1500			320746110585601	02/11/54	53	2437
1501			320746110585601	02/10/55	50	2440
1502			320746110585601	02/13/56	48	2442
1503			320746110585601	02/13/57	51	2439
1504			320746110585601	02/05/58	51	2439
1505			320746110585601	02/05/59	52	2438
1506			320746110585601	02/08/60	53	2437
1507			320746110585601	02/02/61	55	2435
1508			320746110585601	01/20/62	56	2434
1509			320746110585601	02/05/63	57	2433
1510			320746110585601	02/06/64	58	2432
1511			320746110585601	02/05/65	62	2428
1512			320746110585601	02/06/68	63	2427
1513			320746110585601	02/14/69	71	2419
1514			320746110585601	11/01/69	76	2414
1515			320746110585601	12/01/70	77	2413
1516	D-15-13 14BCC1	55-625411	320735110593701	12/23/81	114	2358
1517		55-625411	320735110593701	01/07/84	69	2403
1518	D-15-13 14BCC2	55-618545	320736110593701	12/01/87	134	2338
1519		55-618545	320736110593701	01/17/95	155	2317
1520	D-15-13 14CCC	55-618547	320716110593701	02/16/55	78	2409
1521		55-618547	320716110593701	02/01/56	65	2422
1522		55-618547	320716110593701	02/02/60	73	2414
1523		55-618547	320716110593701	02/01/62	84	2403
1524		55-618547	320716110593701	02/05/65	100	2387
1525		55-618547	320716110593701	11/01/67	104	2383
1526		55-618547	320716110593701	11/01/68	110	2377
1527		55-618547	320716110593701	11/01/69	114	2373
1528		55-618547	320716110593701	12/01/70	121	2366
1529		55-618547	320716110593701	11/15/76	131	2356
1530		55-618547	320716110593701	11/10/77	130	2357

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1531		55-618547	320716110593701	11/12/78	129	2358
1532		55-618547	320716110593701	11/15/79	132	2355
1533	D-15-13 14CCD	55-618546	320713110572801	03/18/55	76	2402
1534		55-618546	320713110572801	01/30/58	71	2407
1535		55-618546	320713110572801	02/02/59	79	2399
1536		55-618546	320713110572801	02/02/60	72	2406
1537		55-618546	320713110572801	02/02/61	87	2391
1538		55-618546	320713110572801	02/02/62	83	2395
1539		55-618546	320713110572801	01/30/63	92	2386
1540		55-618546	320713110572801	02/05/65	100	2378
1541	D-15-13 14CDD1	55-801510	320716110590801	12/22/81	186	2311
1542		55-801510	320716110590801	12/03/87	165	2332
1543		55-801510	320716110590801	01/19/95	162	2335
1544		55-801510	320716110590801	02/22/00	202	2295
1545	D-15-13 14CDD2	55-801178	320713110591201	12/22/81	50	2443
1546		55-801178	320713110591201	12/03/87	56	2437
1547		55-801178	320713110591201	01/19/95	42	2451
1548		55-801178	320713110591201	02/22/00	47	2446
1549	D-15-13 15AAB1		320757110595001	09/01/39	36	2432
1550			320757110595001	09/28/39	36	2432
1551			320757110595001	11/13/39	36	2432
1552			320757110595001	12/26/39	36	2432
1553			320757110595001	03/18/40	35	2433
1554			320757110595001	05/01/40	36	2432
1555			320757110595001	05/28/40	36	2432
1556			320757110595001	08/13/40	37	2431
1557			320757110595001	10/01/40	38	2430
1558			320757110595001	12/30/40	38	2430
1559			320757110595001	02/24/41	36	2432
1560			320757110595001	06/05/41	36	2432
1561			320757110595001	07/11/41	37	2431
1562			320757110595001	08/12/41	37	2431
1563			320757110595001	09/30/41	37	2431
1564			320757110595001	11/13/41	37	2431

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1565			320757110595001	12/29/41	36	2432
1566			320757110595001	03/06/42	36	2432
1567			320757110595001	08/24/42	38	2430
1568			320757110595001	12/23/42	38	2430
1569			320757110595001	04/15/43	38	2430
1570			320757110595001	11/10/43	39	2429
1571			320757110595001	12/16/43	39	2429
1572			320757110595001	01/14/44	39	2429
1573			320757110595001	07/18/44	42	2426
1574			320757110595001	02/12/45	40	2428
1575			320757110595001	07/27/45	42	2426
1576			320757110595001	10/12/45	41	2427
1577			320757110595001	12/06/45	41	2427
1578			320757110595001	03/01/46	40	2428
1579			320757110595001	05/09/46	41	2427
1580			320757110595001	06/17/46	41	2427
1581			320757110595001	07/23/46	42	2426
1582			320757110595001	08/30/46	41	2427
1583			320757110595001	10/11/46	42	2426
1584			320757110595001	12/02/46	40	2428
1585			320757110595001	12/24/46	42	2426
1586			320757110595001	02/14/47	43	2425
1587			320757110595001	03/31/47	43	2425
1588			320757110595001	04/29/47	43	2425
1589			320757110595001	07/14/47	44	2424
1590			320757110595001	08/28/47	44	2424
1591			320757110595001	09/26/47	44	2424
1592			320757110595001	10/28/47	43	2425
1593			320757110595001	01/07/48	44	2424
1594			320757110595001	05/21/48	46	2422
1595			320757110595001	07/28/48	45	2423
1596			320757110595001	08/24/48	45	2423
1597			320757110595001	09/30/48	44	2424
1598			320757110595001	10/25/48	44	2424

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	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1599			320757110595001	11/26/48	45	2423
1600			320757110595001	01/27/49	44	2424
1601	D-15-13 15ABC	55-625408	320751111000701	02/02/60	64	2411
1602		55-625408	320751111000701	02/02/62	76	2399
1603		55-625408	320751111000701	01/30/63	79	2396
1604		55-625408	320751111000701	01/31/64	86	2389
1605		55-625408	320751111000701	12/03/64	84	2391
1606		55-625408	320751111000701	01/15/65	84	2391
1607		55-625408	320751111000701	02/04/65	84	2391
1608		55-625408	320751111000701	11/01/67	96	2379
1609		55-625408	320751111000701	02/06/68	90	2385
1610	D-15-13 15BAB		320756111002001	07/05/72	148	2332
1611	D-15-13 15BBD		320749111002601	06/25/46	43	2432
1612	D-15-13 15BCD		320738111002901	05/05/64	93	2385
1613	D-15-13 15BDC		320738111002201	02/21/55	70	2405
1614			320738111002201	02/15/56	60	2415
1615			320738111002201	02/13/57	64	2411
1616			320738111002201	02/02/59	66	2409
1617			320738111002201	02/04/60	74	2401
1618			320738111002201	02/02/61	81	2394
1619			320738111002201	02/02/62	77	2398
1620			320738111002201	02/06/63	84	2391
1621			320738111002201	01/31/64	89	2386
1622	D-15-13 15CAC	55-620157	320726111002001	01/31/64	90	2390
1623		55-620157	320726111002001	05/01/70	129	2351
1624		55-620157	320726111002001	12/04/74	144	2336
1625		55-620157	320726111002001	12/01/75	158	2322
1626		55-620157	320726111002001	01/05/78	167	2313
1627		55-620157	320726111002001	02/02/78	164	2316
1628		55-620157	320726111002001	12/26/78	172	2308
1629		55-620157	320726111002001	03/05/79	165	2315
1630		55-620157	320726111002001	01/11/80	167	2314
1631		55-620157	320726111002001	12/22/80	174	2306
1632		55-620157	320726111002001	12/28/81	171	2309

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1633		55-620157	320726111002001	12/01/82	174	2306
1634		55-620157	320726111002001	01/09/84	158	2322
1635		55-620157	320726111002001	01/04/85	146	2334
1636		55-620157	320726111002001	01/10/86	132	2348
1637		55-620157	320726111002001	12/23/86	132	2348
1638		55-620157	320726111002001	12/23/87	134	2346
1639		55-620157	320726111002001	01/04/89	141	2339
1640		55-620157	320726111002001	01/08/91	151	2329
1641		55-620157	320726111002001	12/26/91	151	2329
1642		55-620157	320726111002001	12/16/93	156	2324
1643		55-620157	320726111002001	02/03/95	157	2323
1644		55-620157	320726111002001	12/20/96	165	2315
1645		55-620157	320726111002001	02/11/98	173	2307
1646		55-620157	320726111002001	01/21/99	179	2301
1647	D-15-13 15CCC1		320711111002801	02/01/52	52	2438
1648	D-15-13 15CCD2		320710111003301	02/01/52	42	2448
1649			320710111003301	02/12/54	65	2425
1650			320710111003301	02/11/55	62	2428
1651			320710111003301	02/15/56	53	2437
1652			320710111003301	02/13/57	59	2431
1653			320710111003301	01/30/58	60	2430
1654			320710111003301	02/02/59	62	2428
1655			320710111003301	02/04/60	62	2428
1656			320710111003301	02/02/61	70	2420
1657			320710111003301	02/02/62	70	2420
1658			320710111003301	02/05/63	76	2414
1659			320710111003301	01/31/64	81	2409
1660			320710111003301	09/01/65	86	2404
1661			320710111003301	02/06/68	86	2404
1662	D-15-13 15CDB		320719111002101	02/01/70	145	2341
1663	D-15-13 15CDC		320712111002201	09/05/39	32	2459
1664			320712111002201	09/23/39	32	2458
1665			320712111002201	11/13/39	32	2458
1666			320712111002201	12/26/39	32	2458

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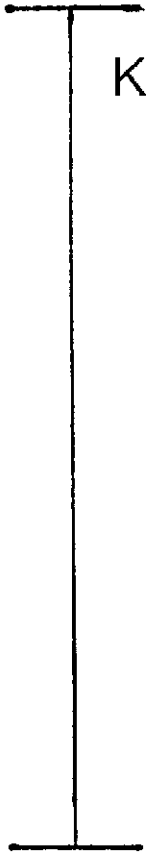
	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1667			320712111002201	02/19/40	35	2455
1668			320712111002201	03/18/40	35	2455
1669			320712111002201	05/01/40	36	2454
1670	D-15-13 15DBB	55-625405	320732111003701	01/16/53	60	2415
1671		55-625405	320732111003701	02/09/53	62	2413
1672		55-625405	320732111003701	02/18/55	66	2409
1673		55-625405	320732111003701	02/15/56	57	2418
1674		55-625405	320732111003701	02/13/57	62	2413
1675		55-625405	320732111003701	01/30/58	67	2408
1676		55-625405	320732111003701	02/02/60	66	2409
1677		55-625405	320732111003701	02/02/62	76	2399
1678		55-625405	320732111003701	01/30/63	83	2392
1679		55-625405	320732111003701	01/31/64	91	2384
1680		55-625405	320732111003701	12/01/64	86	2389
1681		55-625405	320732111003701	02/06/68	95	2380
1682		55-625405	320732111003701	11/01/68	103	2372
1683		55-625405	320732111003701	11/01/69	113	2362
1684		55-625405	320732111003701	12/01/70	117	2358
1685		55-625405	320732111003701	12/01/75	133	2342
1686		55-625405	320732111003701	11/15/76	129	2346
1687		55-625405	320732111003701	11/10/77	129	2346
1688		55-625405	320732111003701	11/12/78	127	2348
1689		55-625405	320732111003701	11/15/79	131	2344
1690		55-625405	320732111003701	12/22/81	169	2307
1691		55-625405	320732111003701	01/07/84	157	2318
1692		55-625405	320732111003701	11/30/87	134	2341
1693		55-625405	320732111003701	01/18/95	156	2319
1694		55-625405	320732111003701	02/22/00	183	2292
1695	D-15-13 15DCB	55-618549	320720111000601	01/31/64	103	2381
1696		55-618549	320720111000601	02/20/78	157	2327
1697	D-15-13 15DCC	55-625404	320712111000601	10/28/47	48	2442
1698		55-625404	320712111000601	02/20/48	46	2444
1699		55-625404	320712111000601	02/09/49	133	2357
1700		55-625404	320712111000601	07/13/50	58	2432



	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1701		55-625404	320712111000601	09/15/50	140	2350
1702		55-625404	320712111000601	01/21/52	52	2438
1703		55-625404	320712111000601	02/06/52	49	2441
1704		55-625404	320712111000601	01/14/53	55	2435
1705		55-625404	320712111000601	02/09/53	60	2430
1706		55-625404	320712111000601	01/04/55	65	2425
1707		55-625404	320712111000601	02/11/55	65	2425
1708		55-625404	320712111000601	01/04/56	57	2433
1709		55-625404	320712111000601	02/01/56	49	2441
1710		55-625404	320712111000601	02/13/57	63	2427
1711		55-625404	320712111000601	12/27/57	53	2437
1712		55-625404	320712111000601	01/30/58	66	2424
1713		55-625404	320712111000601	02/02/59	68	2422
1714		55-625404	320712111000601	02/03/59	59	2431
1715		55-625404	320712111000601	01/05/60	68	2422
1716		55-625404	320712111000601	02/02/60	64	2426
1717		55-625404	320712111000601	02/01/61	79	2411
1718		55-625404	320712111000601	02/02/61	83	2407
1719		55-625404	320712111000601	02/02/62	79	2411
1720		55-625404	320712111000601	02/21/62	74	2416
1721		55-625404	320712111000601	10/10/62	87	2403
1722		55-625404	320712111000601	01/30/63	87	2403
1723		55-625404	320712111000601	03/01/63	92	2398
1724		55-625404	320712111000601	01/31/64	95	2395
1725		55-625404	320712111000601	03/05/64	96	2394
1726		55-625404	320712111000601	01/14/65	93	2397
1727		55-625404	320712111000601	02/04/65	94	2396
1728		55-625404	320712111000601	01/10/66	89	2401
1729		55-625404	320712111000601	04/25/66	93	2397
1730		55-625404	320712111000601	11/01/66	91	2399
1731		55-625404	320712111000601	01/26/67	89	2402
1732		55-625404	320712111000601	03/23/67	95	2395
1733		55-625404	320712111000601	11/01/67	99	2391
1734		55-625404	320712111000601	02/01/68	100	2390

Arizona Department of Water Resources
GWSI Water Level Measurements

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1735		55-625404	320712111000601	11/01/69	111	2379
1736		55-625404	320712111000601	12/01/70	120	2370
1737		55-625404	320712111000601	11/15/76	129	2361
1738		55-625404	320712111000601	11/10/77	128	2362
1739		55-625404	320712111000601	11/12/78	127	2363
1740		55-625404	320712111000601	11/15/79	130	2360
1741	D-15-13 15DDC		320712110595001	04/14/31	47	2443
1742			320712110595001	05/14/31	48	2442
1743			320712110595001	06/17/31	47	2443
1744			320712110595001	07/18/31	48	2442
1745			320712110595001	08/22/31	47	2443
1746			320712110595001	09/11/31	46	2444
1747			320712110595001	10/15/31	46	2444
1748			320712110595001	12/21/31	45	2445
1749			320712110595001	01/29/32	45	2445
1750			320712110595001	02/26/32	45	2445
1751			320712110595001	03/12/32	45	2445
1752			320712110595001	04/01/32	45	2445
1753			320712110595001	05/01/32	45	2445
1754			320712110595001	06/01/32	46	2444
1755			320712110595001	08/01/32	46	2444
1756			320712110595001	09/01/32	46	2444
1757			320712110595001	10/01/32	46	2444
1758			320712110595001	11/01/32	46	2444
1759			320712110595001	12/01/32	47	2443
1760			320712110595001	01/01/33	46	2444
1761			320712110595001	02/01/33	46	2444
1762			320712110595001	03/01/33	46	2444
1763			320712110595001	04/01/33	46	2444
1764			320712110595001	06/01/33	47	2443
1765			320712110595001	07/01/33	47	2443
1766			320712110595001	01/01/34	47	2443
1767			320712110595001	04/01/34	47	2443
1768			320712110595001	05/01/34	47	2443

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1769			320712110595001	08/01/34	48	2442
1770			320712110595001	09/01/34	48	2442
1771			320712110595001	11/01/34	48	2442
1772			320712110595001	12/01/34	48	2442
1773			320712110595001	01/01/35	48	2442
1774			320712110595001	06/01/35	48	2442
1775			320712110595001	08/01/35	48	2442
1776			320712110595001	09/01/35	48	2442
1777			320712110595001	12/01/35	47	2443
1778			320712110595001	07/17/36	48	2442
1779			320712110595001	02/24/37	47	2443
1780			320712110595001	06/16/37	48	2442
1781			320712110595001	07/15/37	49	2441
1782			320712110595001	08/19/37	49	2441
1783			320712110595001	09/01/37	49	2441
1784			320712110595001	10/13/37	49	2441
1785			320712110595001	11/17/37	49	2441
1786			320712110595001	12/21/37	49	2441
1787			320712110595001	01/18/38	49	2441
1788			320712110595001	02/17/38	48	2442
1789			320712110595001	03/16/38	48	2442
1790			320712110595001	04/14/38	48	2442
1791			320712110595001	05/16/38	49	2441
1792			320712110595001	06/16/38	49	2441
1793			320712110595001	08/18/38	49	2441
1794			320712110595001	10/01/38	49	2441
1795			320712110595001	11/01/38	49	2441
1796			320712110595001	12/01/38	49	2441
1797			320712110595001	01/01/39	49	2441
1798			320712110595001	02/01/39	48	2442
1799			320712110595001	03/01/39	48	2442
1800			320712110595001	04/01/39	50	2440
1801			320712110595001	05/01/39	49	2441
1802			320712110595001	07/01/39	49	2441

Arizona Department of Water Resources
GWSI Water Level Measurements

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1803			320712110595001	08/01/39	49	2441
1804			320712110595001	09/05/39	48	2442
1805			320712110595001	11/13/39	48	2442
1806			320712110595001	12/26/39	48	2442
1807			320712110595001	02/19/40	48	2442
1808			320712110595001	03/18/40	48	2442
1809			320712110595001	05/01/40	48	2442
1810			320712110595001	06/01/40	49	2441
1811			320712110595001	07/01/40	49	2441
1812			320712110595001	08/31/40	49	2441
1813			320712110595001	10/04/40	49	2441
1814			320712110595001	11/04/40	49	2441
1815			320712110595001	12/30/40	48	2442
1816			320712110595001	01/01/41	49	2441
1817			320712110595001	02/24/41	48	2442
1818			320712110595001	03/25/41	48	2442
1819			320712110595001	04/28/41	48	2442
1820			320712110595001	06/16/41	49	2441
1821			320712110595001	07/11/41	49	2441
1822			320712110595001	08/14/41	49	2441
1823			320712110595001	09/30/41	49	2441
1824			320712110595001	11/13/41	49	2441
1825			320712110595001	12/29/41	48	2442
1826			320712110595001	02/26/42	49	2441
1827			320712110595001	10/20/42	50	2440
1828			320712110595001	03/31/43	50	2440
1829			320712110595001	10/26/43	51	2439
1830			320712110595001	03/21/44	50	2440
1831			320712110595001	06/27/44	52	2438
1832			320712110595001	10/13/44	51	2439
1833			320712110595001	03/10/45	51	2439
1834			320712110595001	06/19/45	53	2437
1835			320712110595001	03/07/46	52	2438
1836			320712110595001	02/09/49	117	2373

	Location	Registration No.	Well Site ID	Date Measured	Depth to Water	Water Level Elevation
1837			320712110595001	09/15/50	122	2368
1838			320712110595001	02/06/52	63	2427
1839			320712110595001	01/13/53	67	2424
1840			320712110595001	02/01/54	70	2420
1841			320712110595001	02/18/55	74	2416
1842			320712110595001	02/13/56	64	2426
1843			320712110595001	12/27/57	74	2416
1844			320712110595001	02/02/60	70	2420
1845			320712110595001	02/02/62	80	2410
1846			320712110595001	01/30/63	93	2397
1847			320712110595001	01/31/64	101	2389
1848			320712110595001	10/23/67	83	2407
1849			320712110595001	11/01/67	100	2390
1850			320712110595001	12/21/67	55	2435
1851			320712110595001	11/01/68	113	2377
1852			320712110595001	09/28/81		
1853	D-15-13 15DDD		320712110594401	12/01/64	91	2389
1854			320712110594401	09/28/81		
1855	D-15-16 18ADD		320735110442201	12/04/87	175	2726
1856			320735110442201	01/17/95	173	2728

APPENDIX D

Approximate Locations of Trash & Debris

LANDFILLS AND WASTE DISPOSAL SITES ALONG THE SANTA CRUZ RIVER FROM GRANT ROAD TO PIMA MINE ROAD

Prepared for

City of Tucson
Office of Environmental Management

July 1996

Pima Association of Governments

PIMA ASSOCIATION OF GOVERNMENTS

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Supervisor
Pima County

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Chuck Sweet, Manager, Town of Oro Valley

Executive Director

Thomas L. Swanson

Regional Planning Manager

Gail F. Kushner

Hydrologists

Gregory S. Hess
Claire L. Zucker

Project Technical Assistants

Erin G. Andres
Cheryl Karrer

Support Staff

Karen Bazinet
Eleanor Salazar

July 1996

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EXECUTIVE SUMMARY

The purpose of this study was to determine the nature and extent of waste disposal along the Santa Cruz River in east-central Pima County. The study area encompassed the 100-year flood plain of the Santa Cruz River between Grant Road and Pima Mine Road. As part of this study, PAG staff identified several previously undocumented wildcat dumps in this area. In addition, PAG visited known landfills in, or adjacent to, the study area to briefly assess their surface conditions. Because of the scope of the project, no new research was conducted at the documented landfills.

The study consisted of the following tasks: flood plain delineation, aerial photograph and topographic map analysis, personal interviews, literature review, field reconnaissance, and report preparation. Historical and current aerial photographs were analyzed for evidence of disturbed or well-travelled land within the flood plain that could have been used for waste disposal. The topographic maps were studied to determine access routes and to locate excavated gravel pits that might have been filled in with solid waste.

Interviews were conducted to determine local knowledge about the areas of concern. PAG staff interviewed personnel from the University of Arizona Garbage Program, Pima County Solid Waste Management Department, Pima County Department of Environmental Quality, Pima County Department of Transportation, City of Tucson Office of Environmental Management (OEM), Arizona Department of Transportation-Environmental Planning Division, the U.S. Indian Health Service, and the Tohono O'odham Nation.

PAG identified 106 possible waste disposal sites through analysis of aerial photographs of the Santa Cruz River area. PAG visited 68 of these sites, but did not visit sites which were outside of the flood plain or inaccessible by road. Because the study area included tribal lands of the San Xavier District, on May 14, 1996, PAG and OEM staff received permission to conduct field work on tribal lands from the San Xavier District Council. An escort from the San Xavier District Office accompanied PAG staff for field work on tribal lands. At each of the sites, PAG staff noted whether the area was clean or showed evidence of waste disposal. If waste disposal was seen, staff recorded the type, general amount, and distribution of the waste. In most cases, a photograph showing the waste was taken at the site.

PAG staff identified six major waste disposal sites and seventeen minor waste disposal sites within the study area. No significant undocumented landfills were identified through this study. Additional sites had piles of dirt, concrete, and, to a lesser degree, green waste. A "major" waste disposal site was defined as a wildcat dump or undocumented landfill with large piles of waste that were probably dumped by pickup trucks or larger vehicles. A "minor" waste disposal site was defined as a wildcat dump or undocumented landfill which consisted mostly of scattered surface litter which would at the most be equivalent to a few pickup truck loads worth of waste. Major and minor wildcat dumps are listed in the "Conclusions" section of this report.

INTRODUCTION

Pima Association of Governments (PAG), in cooperation with the City of Tucson Office of Environmental Management (OEM), field checked active and abandoned landfills and waste disposal sites, including wildcat dumps, along a reach of the Santa Cruz River. The purpose of this study was to determine preliminary information about waste disposal site locations, land uses, and types of waste deposited at each site. For this study, PAG conducted interviews, analyzed historical aerial photographs, and visited potential waste disposal sites.

The study area encompassed waste disposal sites within, or directly adjacent to, the 100-year flood plain along the Santa Cruz River between Grant Road to the north and Pima Mine Road to the south. The study area included tribal lands which are part of the San Xavier District of the Tohono O'odham Nation. Figure 1 is a regional location map showing the approximate study area boundaries. Potential waste disposal sites were identified by analyzing aerial photographs and conducting interviews. The interviews were conducted with representatives from Pima County, the City of Tucson, the University of Arizona, the State of Arizona, and the Tohono O'odham Nation. Details are provided in the Methodology section of this report. Each site was visited in the field to determine if it was actually used for waste disposal.

PAG and OEM personnel coordinated the field reconnaissance with the San Xavier District Office prior to the scheduled site visits for the sites on San Xavier District tribal lands. Permission to access the San Xavier District tribal lands was granted on May 14, 1996, by the San Xavier Tribal Council. An escort was provided by the San Xavier District during the field reconnaissance.

Two types of waste disposal sites were identified as part of this study: landfills and wildcat dumps. Landfills were defined as sites where waste had been covered by dirt. Documented City of Tucson landfills were also described in this report; however, this report notes only changes at the sites since they had last been documented. Wildcat dumps were defined as sites where waste had been dumped on the ground surface, usually in an area that was not permitted for dumping.

Because this study did not include an investigation of property ownership, there was no reference to land owners unless the information was posted on the property or was provided to PAG by OEM staff. Even if ownership was known, there is no guarantee that the owners are aware of, or responsible for, waste disposal on their property.

This study did not include investigations such as soil-gas monitoring, groundwater sampling, or collection of soil borings, and the study was not intended as an environmental assessment of the properties investigated. Also, only limited efforts were made to gain

access to private property. Interested parties could incorporate this report, as well as additional investigative studies, into a preliminary site assessment for waste disposal sites, but they should not rely on this study as a sole source for field information.

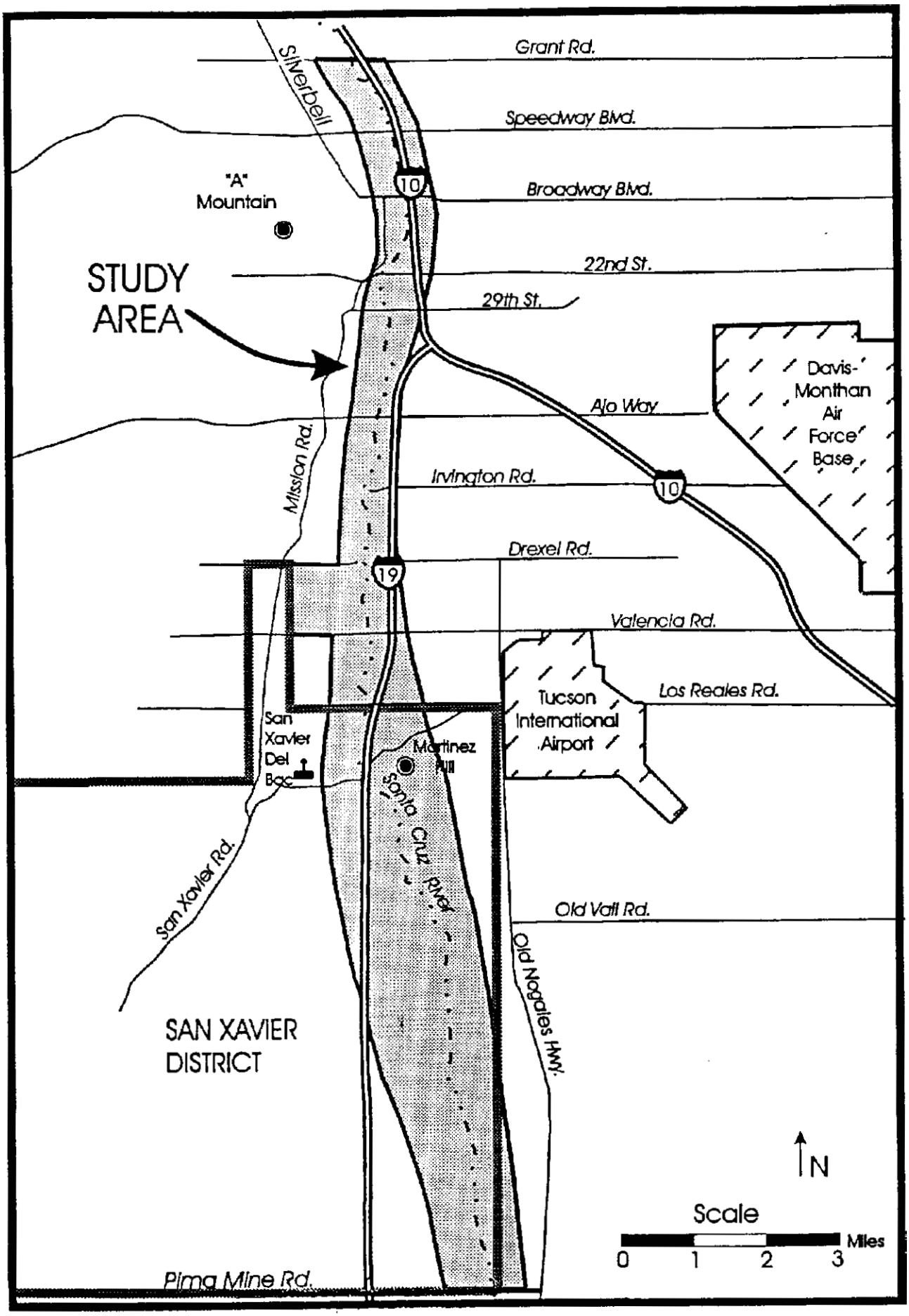


Figure 1 Study Area Location Map

METHODOLOGY

Existing maps and flood plain information were used to delineate the flood plain for this project and to create the project maps. The procedures used to create the maps are described in the "Flood Plain Delineation and Map Preparation" portion of this section.

Existing information about landfills and wildcat dumps was collected from a literature review, a review of USGS topographic maps, and personal interviews. Details of these activities are described in the "Literature Review," "Analysis of Historical Aerial Photographs," and "Personal Interviews" subsections, within the Methodology section of this report. In addition, historical aerial photographs were analyzed to identify sites that appeared to have been disturbed surface areas that might contain undocumented waste disposal. Attempts were made to visit all potential waste disposal sites and all documented landfills during the field reconnaissance portion of the project.

This report is divided into four sections. The first section, the "Introduction," describes the study area and the scope of the project. The second section, "Methodology," describes the techniques used for the flood plain delineation, literature review, analysis of topographic maps and analysis of historical aerial photographs. The third section, "Site Descriptions," includes an overview of sites with wildcat dumping or landfilling, as well as a "Field Descriptions of Sites" subsection, which presents the particular findings from field visits to each site. The fourth section, "Conclusions," summarizes PAG's examination of wildcat dumps and landfills in the study area. Appendix 1 includes the results of the aerial photograph analysis, and is intended as a guide for further photograph review.

Flood Plain Delineation and Map Preparation

The first task in this investigation was to identify the 100-year flood plain within the study area. The flood plain delineation was taken from the 1992 Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for the area outside the San Xavier District and two reports for the District lands (John M. Tettemer & Associates, 1984 and Bureau of Indian Affairs, 1986). A few of the FIRM maps were last revised in 1983 and may be outdated. However, most of the bank protection constructed since that time has been in the areas that have been updated since 1983. The Flood Hazard Areas on the FIRM maps were divided into flood zone areas: A, AE, AO, and X. These are shown collectively as the 100-year flood plain in Figures 2 through 6 at the end of this section. The FIRM map flood zone definitions are shown on Table 1:

Table 1: FIRM Map Flood Hazard Areas

FIRM Code	Description
Zone A	Special Flood Hazard Areas inundated by 100-year flood with the base flood elevations determined
Zone AE	Special Flood Hazard Areas inundated by 100-year flood with no base flood elevations determined
Zone AO	Special Flood Hazard Areas inundated by 100-year flood with average flood depths of 1 to 3 feet
Zone X	Areas of 500-year flood, areas of 100-year flood with average depth of less than 1 foot or with drainage areas less than 1 square mile, or areas protected by levees from the 100-year flood

Due to the status of the San Xavier District tribal lands as property of a separate nation, it was necessary to seek sources other than the FIRM maps to define the flood plain on the District's land. The references used for the flood plain within the San Xavier District were a *Report on Hydrology and Flood Control for the San Xavier Planned Community* by John M. Tettemer & Associates (1984) and a *Draft Environmental Impact Statement for the San Xavier Planned Community* by the Bureau of Indian Affairs (1986). Two reports were used to confirm the flood plain delineation within the San Xavier District boundaries: *Surficial Geologic Maps of the Northeastern, Southeastern, and Southwestern Portions of the Tucson Metropolitan Area.*(Jackson, 1989) and *Surficial Geologic Maps of the Tucson Metropolitan Area* (McKittrick, 1988). This research resulted in a flood plain that was different from that shown in the PAG 1995 report entitled *Landfills and Waste Disposal Sites along the Upper Santa Cruz River* (PAG, 1995a).

The sites were numbered according to the order they were visited in the field, renumbered so the site numbers generally increased from north to south, and plotted on computer-generated basemaps (Figures 2 through 6). The basemaps were prepared by overlaying the PAG's 1996 Draft Landfill Map and the Pima County Basemap from MapInfo Professional™ (Version 4.0, 1992-1995). The section lines, portions of the Santa Cruz River and its West Branch, and some major roads were provided by PAG's Landfill Map. Highways, additional paved roads, and dirt roads were provided by the MapInfo map, the 1994 Metropolitan Tucson and Eastern Pima County Street Atlas, and the 1995 Pima County Roadway System Map. Some reaches of the Santa Cruz River, particularly in the Grant Road and Martinez Hill areas, were redrawn to reflect current channel characteristics using 1995 aerial photographs as a base reference. Flood plains were added to the maps based on the FIRM maps, the John M. Tettemer & Associates report, and the Bureau of

Indian Affairs report. These maps were combined using AutoCAD and edited using Generic CADD.

Literature Review

Existing literature was reviewed to determine where old landfills, gravel pits, and/or disturbed vacant lands were located. Documents reviewed are shown on Table 1 with the area of coverage, date, and type of information provided. These documents are not summarized in this report; instead, they were used to direct PAG's field investigations.

Table 2: Summary of literature review.

Document and Author	Date	Area of Coverage	Type of Information
U.S.G.S. Topographic Maps (including the following 7.5' quadrangles: Cat Mountain, San Xavier Mission, Tucson, and Tucson SW)	1957-1975	Entire study area	Road access and locations of gravel pits, borrow pits, wells, etc.
Draft Environmental Impact Statement, Santa Cruz River Park, Tucson, Arizona, Guy S. Greene & Assoc. and Don Laidlaw & Assoc.	1976	From Grant Road to Los Reales Road	Land use and bank protection along the Santa Cruz River
Upper Santa Cruz Groundwater Quality Baseline Report, Upper Santa Cruz Basin Mines Task Force	1979	The San Xavier District	Land use
Landfill Environmental Studies Program Phase I (LESP I) - Final Report, Dames & Moore	1989	From Grant Road to Ajo Way	Locations of landfills
Application of Historic Well Closure Information for Protection of Existing Wells, PAG	1992	From Speedway Boulevard to Silverlake Road and from Ajo Way to Los Reales Road	Locations of disturbed vacant land and landfills

Document and Author	Date	Area of Coverage	Type of Information
Environmental Assessment of 10 City - Operated Landfills, Tucson, Arizona, PAG	1993	From Grant Road to Ajo Way	Locations of landfills and characteristics of adjacent bank protection
Landfills along the Santa Cruz River in Tucson and Avra Valley, Arizona, PAG	1995	Entire study area	Locations of landfills, including those with less documentation
Landfills and Waste Disposal Sites along the Upper Santa Cruz River, PAG	1995	From Old Vail Road to Pima Mine Road East of San Xavier District boundaries	Locations of landfills and disturbed vacant land
Identified Public Landfills (Excluding State and Federal Facilities) and Permanent Transfer Stations in Eastern Pima County and Ajo - Draft Map, PAG	1996	Entire study area	Locations of landfills

Analysis of Topographic Maps

Topographic maps were collected and analyzed for the entire study area. These maps were dated 1957 to 1968 and three of them had been photorevised in 1975. Any gravel pits, wells, ponds, storage bins, borrow pits, or sewage ponds shown on the maps were noted and corroborated through photo analysis or field investigation.

Personal Interviews

Interviews with Pima County, City of Tucson, University of Arizona, State of Arizona, and Tohono O'odham Nation personnel were conducted to identify potential disposal sites in the study area. PAG staff conducted the interviews in the Spring of 1996 to collect information on the potential sites' locations, sizes, type of waste, and the presence of bank protection. The site information did not include in-depth descriptions of the landfills.

Pima County personnel had the most comprehensive information about the presence of illegal dumping along the Santa Cruz River and the condition of the bank protection. Kenrick Custer, Pima County's Wildcat Dump Officer, provided information about illegal dumping in the study area. He identified twelve wildcat dumps, nine potential problem sites, and sixteen landfill sites in the area. Susan Hess at Pima County Solid Waste Management Department was contacted about closed landfills, but she possessed no information about potential sites in the study area. Becky Pearson at Pima County Department of Transportation was contacted because she was familiar with the landfills along the river adjacent to bank protection. She mentioned the 29th Street and St. Mary's Landfills, which have bank protection along the landfill edges, but she had no additional information about them.

The University of Arizona Garbage Program staff were contacted because they had been excavating old dumps along the Santa Cruz River. Tim Jones at the University Garbage Program pointed out the location of an old dump directly south of Grant Road on the east bank of the Santa Cruz River. He also mentioned the presence of approximately ten-foot deep trenches located south of St. Mary's Road along the Santa Cruz River. Tim Jones believed that the trenches were used to dispose of incinerator ashes in the 1940's.

The Arizona Department of Transportation (ADOT) was contacted, because they encountered old landfills during construction along I-10 and I-19. Tom Sullivan at the ADOT Environmental Planning Division indicated one landfill site that was located beneath the ADOT Maintenance Division site directly south of Grant Road.

Tohono O'odham Nation personnel were contacted after permission to access tribal lands was granted by the San Xavier District Tribal Council. Carol Young, the Environmental Representative with the Tohono O'odham Nation, and Mark Jackson from the U.S. Indian Health Service were contacted. Neither of them knew of any landfilling or open dumping in the study area. However, Randy Willard at the U.S. Indian Health Service said that although he knew of no open dumps that existed in the study area, there were two dumps near Black Mountain approximately three miles west of the study area.

Analysis of Historical Aerial Photographs

PAG staff obtained aerial photographs of the entire study area from Pima County Department of Transportation Mapping and Records. Reprints of these aerial photographs, dated 1974, 1990, and 1995, were used for the analysis. Complete coverage was available for 1974 and 1990, and all but one photo was available for 1995 (T14S R13E, Secs. 3,4,9,10). The reprints included four Sections per photograph and were provided to PAG as blue lines at a scale of 1 inch = 400 feet.

Aerial photographs were analyzed for evidence of potential landfilling or waste disposal. Cleared or excavated areas were circled on the photographs and these sites are described in an annotated list of photographs included in Appendix 1. This appendix also includes a description of the general land uses adjacent to suspected sites. The following types of land uses, noted on the aerial photographs, were considered to be potential indicators of landfilling or waste disposal: disturbed vacant land with road access; abandoned excavation sites (pits and ponds) with road access; and bulldozed areas. Other land uses that were noted during the aerial photograph analysis included active and abandoned agricultural lands, highways and roads, industrial complexes, commercial areas, and undisturbed vacant lots. A few of the areas noted on the photographs were not visited in the field, because they were inaccessible by road or because they were out of the 100-year flood plain. The original annotated blue lines are stored at OEM, but PAG has retained copies of the blue lines for future review.

Reconnaissance Mapping

Reconnaissance mapping was conducted throughout the study area. Efforts were concentrated on potential landfills or waste disposal sites that were targeted through the analysis of aerial photographs and topographic maps or through interviews. Each of the sites was located on the aerial photographs and was numbered in the order in which it was visited in the field. In the case of the sites within the boundaries of San Xavier District tribal lands, permission to access the tribal lands was granted after the potential sites were located. The sites were renumbered during compilation of this report so that the site numbers generally increased from north to south. These numbers are shown on the Site Location Maps and they directly correspond to the site numbers listed in the "Site Descriptions" section of the report. During a three day period in April and May of 1996, 68 sites were visited to gather the following information about each site:

- current land use on site;
- current land use adjacent to the site, if relevant;
- evidence for ongoing wildcat dumping;
- evidence for buried waste;
- evidence for ongoing storage of suspected hazardous materials;
- evidence for differential settling, which can be a common characteristic of old landfills;
- approximate location of waste, if evident;
- types of materials, if evident;
- approximate age of waste, if evident;
- evidence of cleanup; and
- access, including roads and fences.

If evidence for wildcat dumping or landfilling was observed while driving slowly past the site, PAG staff stopped and walked through the site. Access routes used by PAG staff during the field visit are listed under each site description. Additional access routes may be available. However, if "no access" is noted in the site description, PAG staff was not able to find an access route to the site. Thirteen sites of the 68 were not visited because they were inaccessible due to closed or nonexistent roads, barbed wire or wooden fences, or "No Trespassing" signs.

PAG staff took field photographs at 21 of the 68 sites visited during this study. Field photographs were taken if the waste was well exposed and clustered so that it could be shown in a photograph. A field photograph was generally not taken if the waste consisted of distributed surface litter. Photographs were included in the "Field Descriptions of Sites" section of the report if the nature of the waste disposal was accurately shown in the photograph.

Several types of containers were seen at the sites, and details are given in the "Field Descriptions of Sites" section of this report. Small containers found at the sites included cans, bottles, and buckets that held less than 5 gallons of material. Drums were defined as containers that held approximately 55 gallons of material. Most of the containers identified at the sites were made out of metal and glass, except for small motor oil bottles and one-gallon jugs, which were commonly made out of plastic.

A general description of land use and waste disposal is included in the "Site Descriptions" section, followed by a detailed description of each site. In many cases, sites that looked suspicious on the aerial photographs did not show evidence of waste disposal when visited during the field reconnaissance part of this study.

SITE DESCRIPTIONS

General Land Use

Land use varied extensively within the study area. Within the City of Tucson, industrial and commercial uses were prevalent near the Santa Cruz River, but south of Silverlake Road these land uses were concentrated near the intersection of major roads. Residential density generally decreased north to south. The I-10 and I-19 freeways were located just east of the Santa Cruz River, and they paralleled the river throughout the study area. Excavation associated with construction of the interstate frontage roads was noted from Grant Road to Speedway Boulevard at the time of the site visit. The Santa Cruz River Park was located along both banks of the river from Grant Road to Silverlake Road and then continued on both sides of the Santa Cruz River from Ajo Way to Irvington Road. Along the Santa Cruz River, north of the San Xavier District, there were several vacant lots, some of which were closed landfills, including Rio Nuevo North, Rio Nuevo South, "A" Mountain, and Ryland landfills. There were also a few wildcat dumps along the banks, but they were not extensive.

Within the San Xavier District, south of the City of Tucson, the land use was primarily agricultural, consisting of grazing lands and active and retired cropland. There were also residential areas, especially south of the San Xavier Mission along San Xavier Loop Road and Little Nogales Drive. No landfills were identified in the San Xavier District. Wildcat dumps, identified mostly along the banks of the Santa Cruz River, were not extensive.

Undocumented Landfills and Wildcat Dumps

As part of this study, PAG searched for previously undocumented landfills and wildcat dumps. No undocumented landfills were identified in the study area. A few sites had small amounts of buried trash or a slightly hummocky topography, but there was not substantial evidence to indicate the presence of a landfill. Old landfills can be difficult to identify in the field, unless there are obvious signs such as exposed waste at the land surface.

Wildcat dumping was identified at 23 of the sites surveyed for this project. The sites were divided into two size categories: 1) "major," i.e. waste disposal sites with large piles of waste that were probably dumped by pickup trucks or, in some cases, larger vehicles; and 2) "minor," i.e. sites that consisted primarily of scattered surface litter which would at the most be equivalent to a few pickup truck loads of waste. Major wildcat dumps were identified at sites 11, 34, 37, 48, 56, and 57. Trash at these sites included

bottles, cans, car parts, metal, rubber tires, oil filters, construction debris, miscellaneous household trash (appliances, furniture, cloth), and empty 55-gallon metal drums. Most containers appeared to have been empty and a few of them had readable labels. Minor wildcat dumps, containing trash, were identified at seventeen other sites: 9, 12, 13, 14, 18, 19, 23, 27, 28, 33, 41, 45, 49, 52, 61, 62, and 64. In addition, many sites (3, 4, 7, 9, 10, 11, 12, 13, 14, 17, 19, 20, 23, 24, 27, 28, 29, 32, 34, 36, 37, 41, 42, 43, 44, 45, 48, 56, 57, 58, 61, and 62) contained piles of dirt, concrete debris, or green waste. In most cases, the size of the piles was comparable to a few pickup truck loads of the material.

Documented Landfills

PAG staff also visited nine documented closed landfills in, or near, the study area. The landfills located in the more developed urban area north of Silverlake Road included "El Dumpe," St. Mary's, Rio Nuevo North, Rio Nuevo South, "A" Mountain, Mission, and 29th Street landfills. The landfills located in the less urbanized area south of Silverlake Road included Cottonwood and Ryland landfills. Most of the landfills' characteristics were presented in the LESP Phase I reports by Dames & Moore (1989) and PAG (1993). PAG staff visited these landfills to document changes in surface conditions subsequent to the LESP investigations. It was beyond the scope of this project to conduct any additional research into the nature or extent of the landfills.

"El Dumpe" Landfill was located north of Speedway Boulevard, east of the Santa Cruz River and west of I-10 (Site 4 on Figure 2). Before the highway construction, the material had all been buried (Jones, 1996). This landfill was described in PAG's 1995 report. Evidence for the landfill that was noted during the field reconnaissance included previously buried landfill material that had been excavated during highway construction as well as a cross-section of material still *in situ*. After PAG's field site check, the excavated material was removed and sent to Harrison Landfill (Murray, 1996).

St. Mary's Landfill was located south of St. Mary's Road and west of Grande Avenue (Site 6 on Figure 2). This landfill was described in PAG's 1993 report and its location was shown on PAG's 1996 draft landfill map. Evidence for the landfill that was noted during the field reconnaissance included some hummocky topography either due to surface grading or to differential settling. Menlo Park had been constructed over the landfill at this site. There had been no changes to the site since PAG's last visit in the Spring of 1993.

The Rio Nuevo North Landfill was located south of St. Mary's Road and north of Congress Street along the western bank of the Santa Cruz River (Site 7 on Figure 2). This landfill was described in PAG's 1993 report and its location was shown on PAG's 1996

draft landfill map. Evidence for the landfill that was noted during the field reconnaissance included hummocky topography either due to site grading or differential settling. There appeared to have been a methane monitoring well system around the perimeter. Since PAG's last visit to the landfill, construction of a Pima Community College campus building had begun north of the landfill. The methane monitoring well system had been modified to match the parking lot grades along the northern edge of the site (Murray, 1996). The landfill site appeared to have been unchanged.

The Rio Nuevo South Landfill was located south of Congress Street and east of Mission Road on the western bank of the Santa Cruz River (Site 10 on Figure 2). This landfill was described in PAG's 1993 report and its location was shown on PAG's 1996 draft landfill map. Rio Nuevo South consisted of two smaller landfills: Nearmont, located in the northwestern part of the site, and Congress, located in the eastern part of the site. Evidence for the landfill that was noted during the field reconnaissance included hummocky topography possibly due to differential settling. Since PAG's 1993 visit to the landfill, there was less green waste along the northern border of Congress Landfill and there had been construction to the north of Congress Landfill. Also, the land surface covering Nearmont showed evidence of a recent fire.

The "A" Mountain Landfill was located on the western bank of the Santa Cruz River north of the convergence of Mission Road and the River (Site 11 on Figure 2). This landfill and its location were described in Dames & Moore's 1989 report. Its location was also shown on PAG's 1996 draft landfill map. Evidence for the landfill that was noted during the field reconnaissance included hummocky topography, possibly due to differential settling, and exposed materials on the surface. Most of the waste appeared to have been on the surface, but some of it may have been part of the landfill.

The Mission Landfill was located at the northeastern corner of Mission Road and 22nd Street (Site 16 on Figure 2). This landfill was described in PAG's 1993 report and its location was shown on PAG's 1996 draft landfill map. Evidence for the landfill that was noted during the field reconnaissance included hummocky topography either due to surface grading or to differential settling. The Santa Cruz River Park had been constructed on top of the landfill. There had been no changes to the site since PAG's last visit in the Spring of 1993.

The 29th Street Landfill was located directly north of Silverlake Road along the western bank of the Santa Cruz River (Site 21 on Figure 3). This landfill was described in PAG's 1993 report and its location was shown on PAG's 1996 draft landfill map. PAG staff was not able to visit this landfill because Pima County facilities had been built on site after landfill closure. Based on drive-by viewing of the site, there had been no changes since PAG's last visit in the Spring of 1993 (i.e., no new surface waste or differential settling).

Cottonwood Landfill was located north of Ajo Way west of the Santa Cruz River (Site 25 on Figure 3). This landfill was described in the 1989 Dames & Moore report. Its location was also shown on PAG's 1996 draft landfill map. Evidence for the landfill that was noted during the field reconnaissance included the presence of what appeared to have been a methane monitoring well system. However, no exposed waste or hummocky topography was seen. Based on aerial photographs, a manufactured-home subdivision had been constructed over the landfill site since 1990.

The Ryland Landfill was located west of the I-10/I-19 intersection along the east bank of the Santa Cruz River (Site 22 on Figure 3). This landfill was described in PAG's 1993 report and its location was shown on PAG's 1996 draft landfill map. Evidence for the landfill noted during field reconnaissance included hummocky topography probably due to differential settling and exposed materials on the landfill surface and along the eroded and unprotected river bank. There had been no changes since PAG's last visit during the Spring of 1993.

Originally, the sites were numbered in the order they were visited in the field. However, the sites were renumbered for the report, so that site numbers generally increased from north to south. These site numbers directly correspond to the numbers shown on the Site Location Maps at the beginning of the report. Field photographs were taken of each of the sites that showed significant wildcat dumping. The photographs were included in the report, only if they depicted a representative picture of the site. The detailed description and location of each site is presented in the "Field Descriptions of Sites" section. Because the study area was so large, the sites are presented on five separate maps (Figures 2 through 6) showing the area from north to south. The aerial photographs were not included in this report.

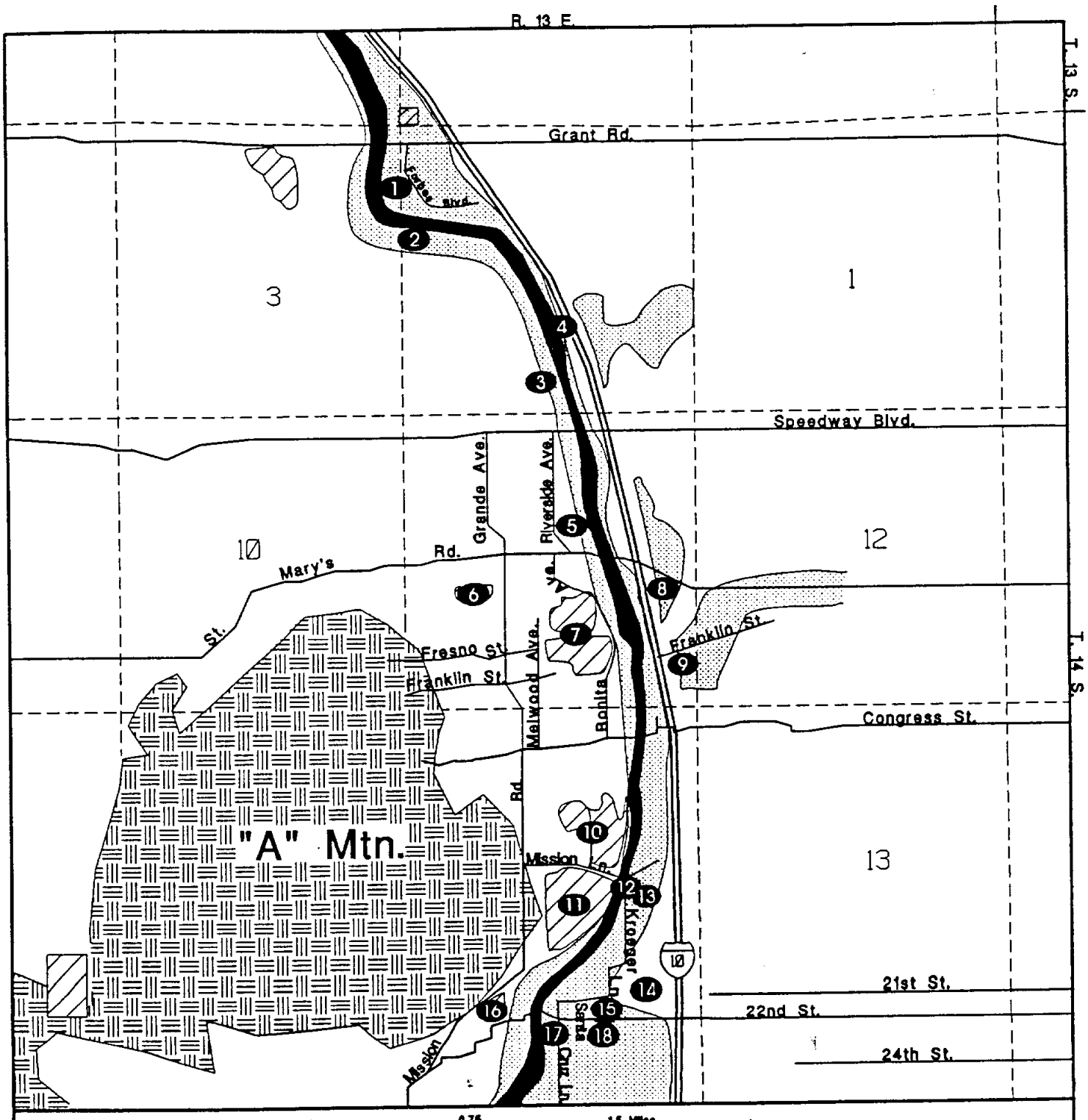


FIGURE 2

Site Location Map
Santa Cruz Study Area
(Grant Rd. to 26th St.)

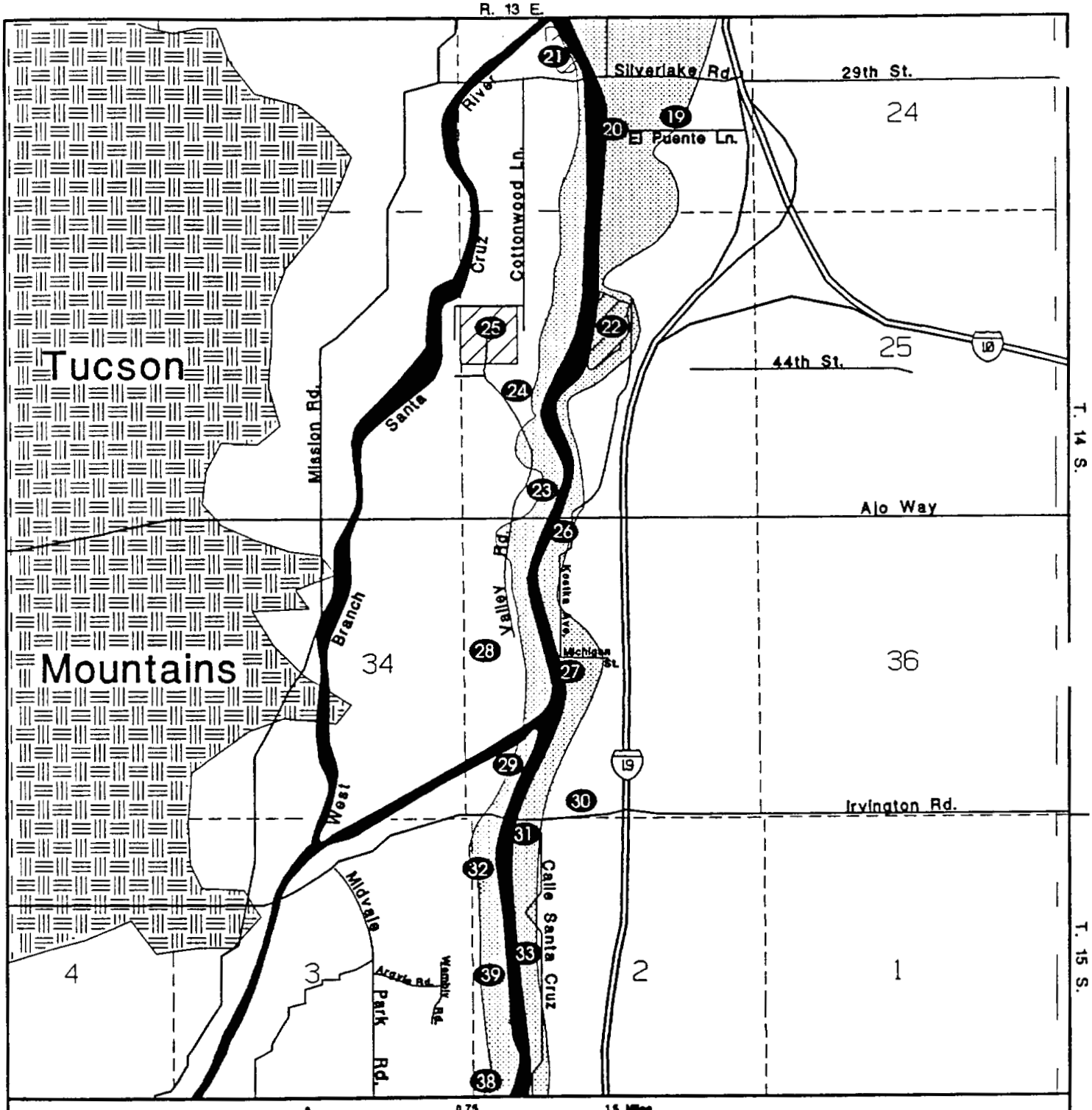


FIGURE 3

Site Location Map

Santa Cruz Study Are
(27th St. to S. of Irvington R

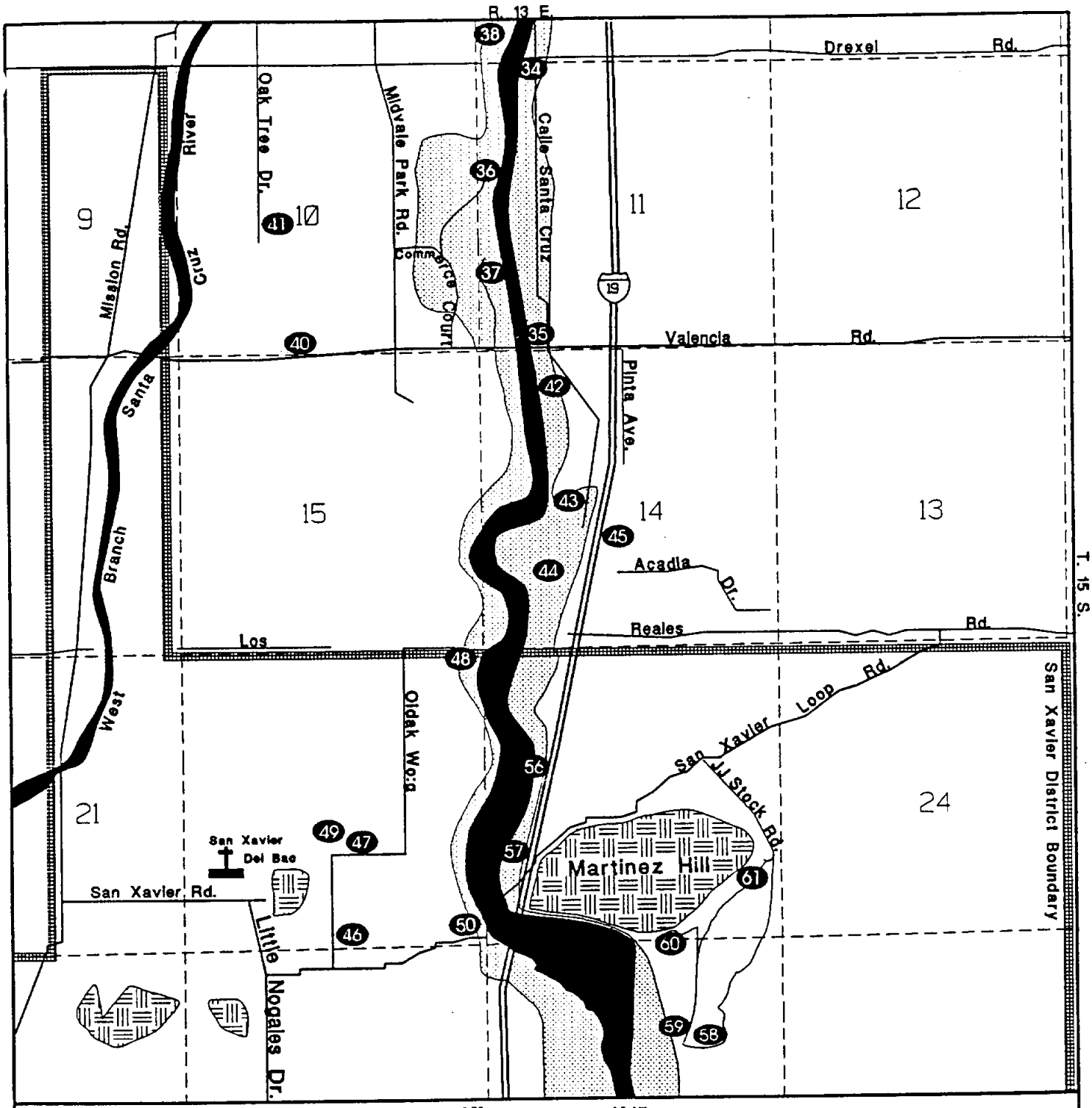
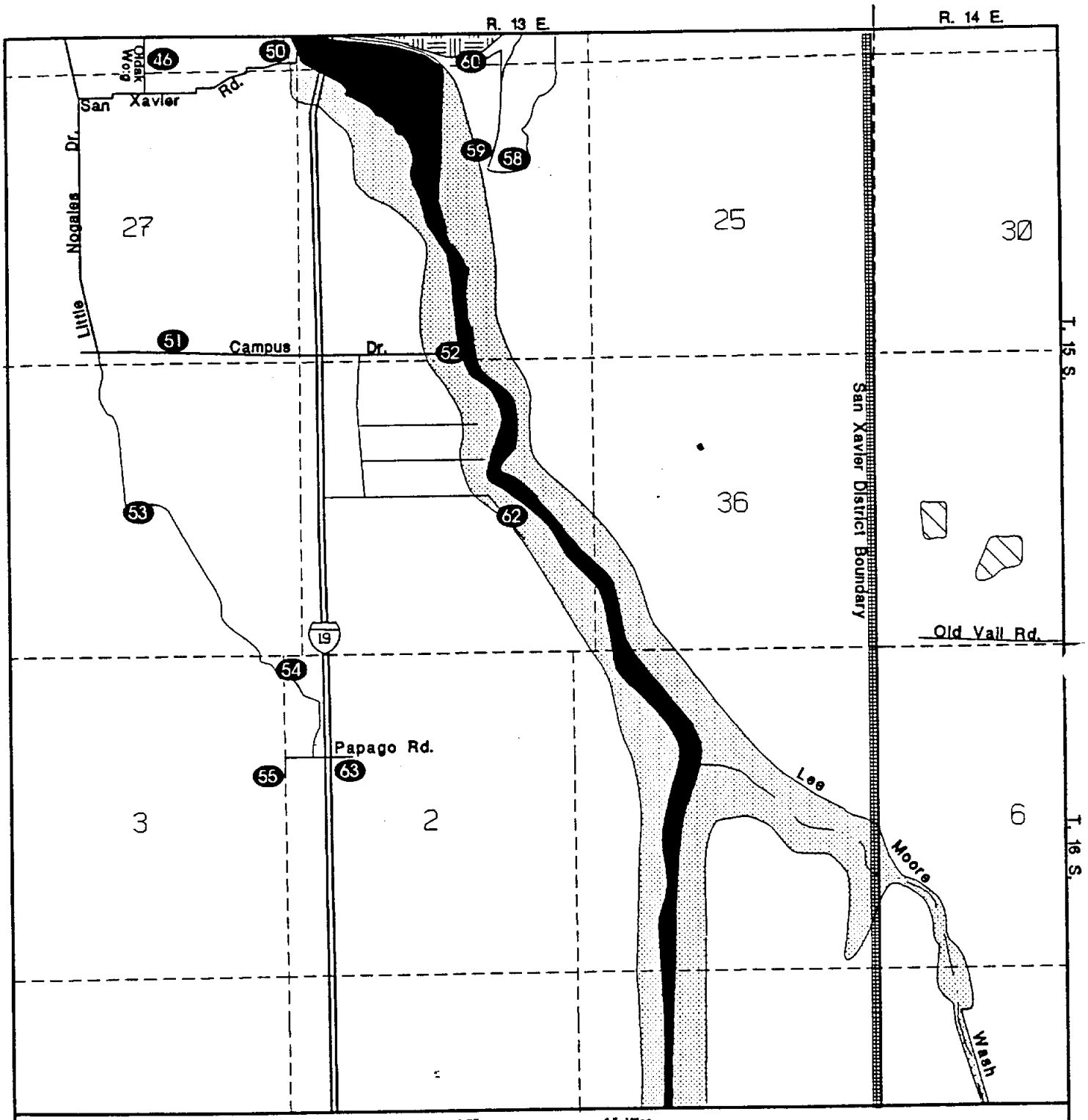


FIGURE 4

Site Location Map
Santa Cruz Study Area
(Drexel Rd. to S. of San Xavier Loop Rd.)

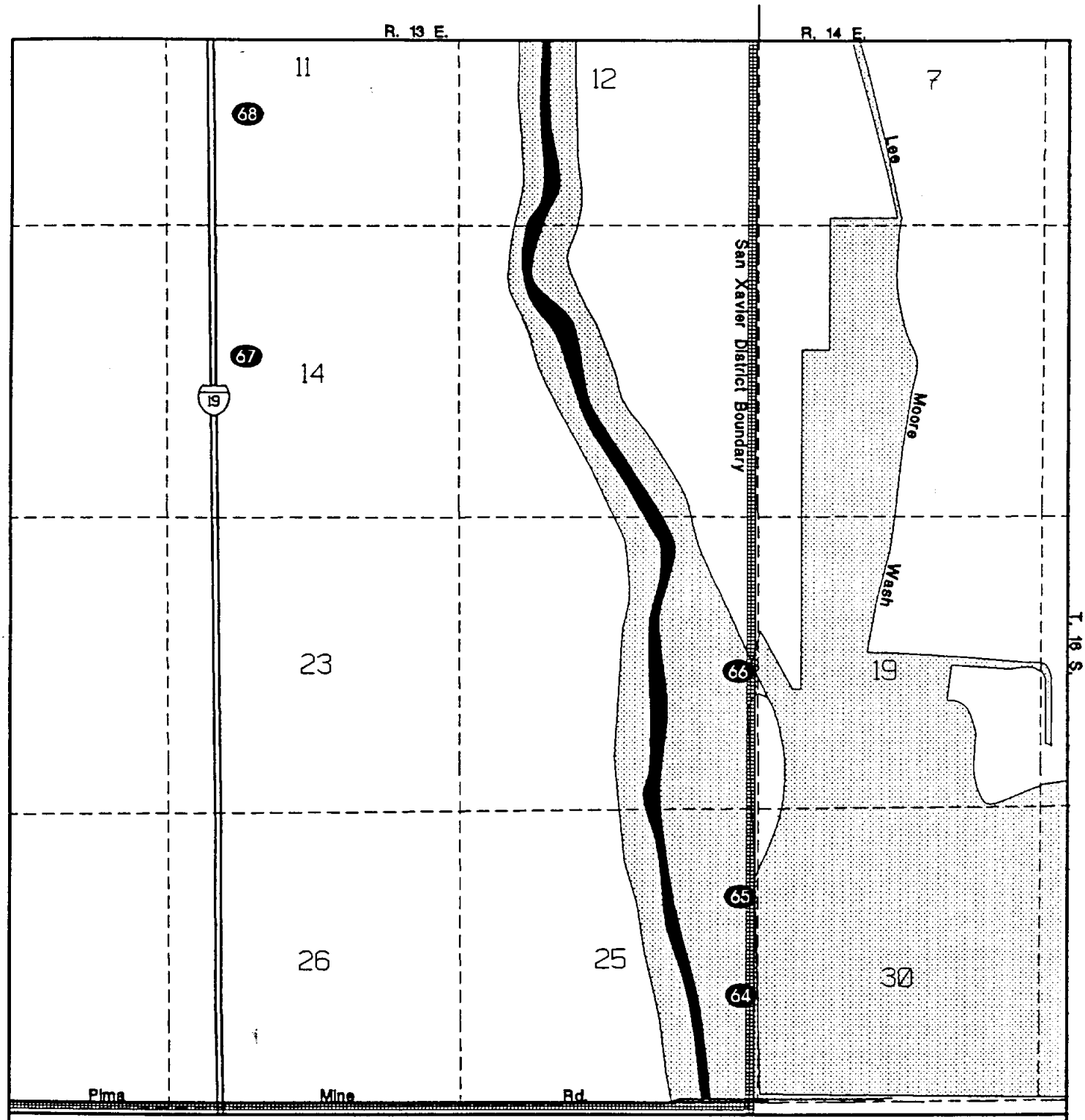
Note: Base map, including Township/Range, river and landfill locations, are from PAG 1994. Additional streets are from Mapinfo (version 4.0) and the 1994 Pima County Road Atlas. Flood plain is approximated from FIRM maps for areas within the city & county, but outside the San Xavier District. Two documents were used to determine the flood plain on San Xavier District Lands: Bureau of Indian Affairs, 1994; and John M. Tettemer & Associates, 1994.



Note: Base map, including Township/Range, river and landfill locations, are from PAG 1996. Additional streets are from MapInfo (version 4.0) and the 1994 Pima County Road Atlas. Flood plain is approximated from FIRM maps for areas within the city & county, but outside the San Xavier District. Two documents were used to determine the flood plain on San Xavier District Lands: Bureau of Indian Affairs, 1986; and John M. Tettemer & Associates, 1984.

FIGURE 5

Site Location Map
Santa Cruz Study Area
(San Xavier Loop Rd. to S. I-19)



Note: Base map, including Township/Range, river and landfill locations, are from PAG 1996. Additional streets are from Mapinfo (version 4.0) and the 1994 Pima County Road Atlas. Flood plain is approximated from FIRM maps for areas within the city & county, but outside the San Xavier District. Two documents were used to determine the flood plain on San Xavier District Lands: Bureau of Indian Affairs, 1996; and John M. Tettemer & Associates, 1984.

FIGURE 6

Site Location Map

Santa Cruz Study Area

(I-19 to Pima Mine Rd.)

Field Description of Sites

The following sites were visited because the interviews, literature review, or aerial photograph analysis indicated that the land had potentially been used for waste disposal. The following site descriptions are based on field observations only. If a particular facility or feature that could help to easily identify the site was noted in the field, it is listed in the description after the site number and before the location information.

Site 1

Location: T14S R13E, Section 3
Approximately 1/4 mile south of Grant Road, west of Forbes Boulevard, and directly east of Santa Cruz River

Field Description: No dumping or landfilling was evident on this site. The site consisted of a vacant lot and a section of the Santa Cruz River Park with an asphalt path, power lines, and landscaping, including palo verde and mesquite trees. Access was available from the parking lots to the east and north, but there was a short post-and-cable fence that prohibited vehicles from entering the Santa Cruz River Park. The surrounding land uses included industrial areas to the east and north and the Santa Cruz River with bank protection to the west and south. This site was visited because hummocky topography was identified in the 1974 photograph (prior to the construction of the Santa Cruz River Park), and Tom Sullivan from ADOT had indicated that an old landfill had existed in this location.

Site 2

Location: T14S R13E, Section 3
Approximately 1/3 mile south of Grant Road and directly north of Riverview Boulevard, along west bank of the Santa Cruz River

Field Description: No dumping or landfilling was evident on this site. The site consisted of a section of the Santa Cruz River Park with an asphalt path and landscaping, including palo verde and mesquite trees. Access was available from Riverview Boulevard, but there was a short post-and-cable fence that prohibited vehicles from entering. The surrounding land uses included residential areas to the west, east and south, and the Santa Cruz River with bank protection to the north and east. This site was visited because homes had existed on the site in the 1974 photograph that were not present in the 1990 photograph, and the resulting vacant lot (in the 1990 photograph) appeared to have been disturbed.

Site 3

Location: T14S R13E, Section 2
Approximately 200 feet north of Speedway Boulevard, directly east of the Arizona School for the Deaf and Blind, and approximately 100 feet west of the Santa Cruz River

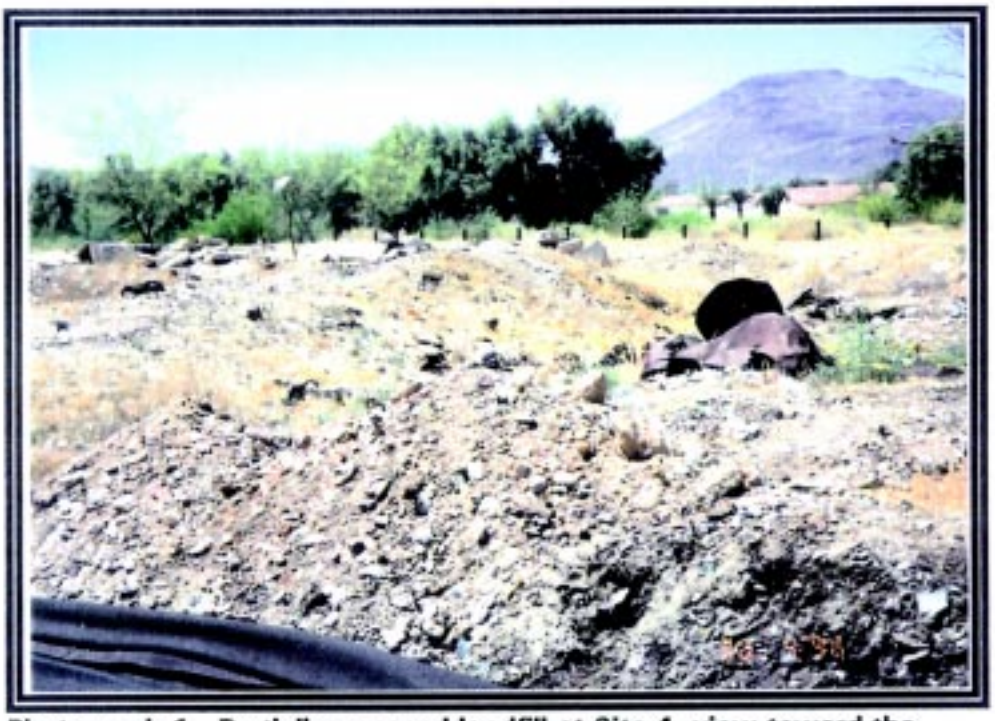
Field Description: No dumping or landfilling was evident on this site. The site consisted of a vacant lot of approximately 100 X 300 feet, with a few palo verde and mesquite trees. There were piles of concrete debris and bricks. Access was available from the Arizona School for the Deaf and Blind (ASDB) parking lots and access road. The surrounding land uses included the ASDB school to the west and north, Speedway Boulevard and residential areas to the south, and the Santa Cruz River to the east. This site was visited because it appeared to have been disturbed in the 1990 photograph.

Site 4

"El Dumpe"

Location: T14S R13E, Section 2
Approximately 1/10-1/2 mile north of Speedway Boulevard, directly east of the Santa Cruz River, and directly west of I-10

Field Description: This site consisted of a frontage road construction site, measuring approximately 200 feet wide by 1/2 mile long, with various types of dirt-moving machinery. Piles of dirt and an excavation site of an old landfill ("El Dumpe") were located approximately 1/3 mile north of Speedway Boulevard in an area approximately 100 feet wide by 200 feet long. Pottery shards, glass, iron and other scrap metal, 55-gallon drums, and asphalt debris were seen at the site. Photograph #1 shows the southern half of the exposed portion of the landfill. Access was possible from I-10, but restricted by the construction company for safety reasons. The surrounding land uses included I-10 to the east, the Santa Cruz River to the west, an AM/PM Mini Mart under construction to the south, and an industrial park to the north.



Photograph 1. Partially exposed landfill at Site 4, view toward the west-northwest.

Site 5

Location: T14S R13E, Section 11
Approximately 200 feet north of St. Mary's Road, directly east of Riverside Avenue, and directly west of the Santa Cruz River

Field Description: No dumping or landfilling was evident on this site. The site consisted of a section of the Santa Cruz River Park with an asphalt path and landscaping. Access was available from Riverside Avenue, but there was a short post-and-cable fence that prohibited vehicles from entering. The surrounding land uses included residential areas to the north and west, the Santa Cruz River with bank protection to the east, and commercial areas to the south. The site was visited because it appeared to have been hummocky in the 1974 photograph, prior to the Santa Cruz River Park construction.

Site 6

St. Mary's Landfill

Location: T14S R13E, Section 11
Approximately 1/3-1/4 mile south of St. Mary's Road, on northwest corner of Grande Avenue and Fresno Street

Field Description: St. Mary's Landfill was covered by a parking lot and a playing field after closure. Access was available from Grande Avenue and included a park access road to the

parking lot. The surrounding land uses included single-family residential areas to the south, east and west, multi-family residential areas to the north and northeast. The site was slightly hummocky, but this may have been due to grading of the site after the landfill had been closed, rather than to differential settling. PAG staff did not see any change in the appearance of the site since the area had been visited in the Spring of 1993.

Site 7
Rio Nuevo North Landfill
Location: T14S R13E, Section 11
Approximately 1/4-1/2 mile south of St. Mary's Road, approximately 1/4 mile east of Melwood Avenue, and directly west of the Santa Cruz River
Field Description: Rio Nuevo North Landfill was located at this site. There appeared to have been methane monitoring wells located on the northern part of the site. Piles of rock, dirt, and asphalt were seen on the southern part of the site. The landfill material was not exposed. PAG staff did not see any change in the appearance of the site since the area had been visited in the Spring of 1993. Access was available from Bonita Avenue and Commerce Park Loop. The surrounding land uses included residential areas to the west and south, Dragon's View Restaurant to the northeast, and the Santa Cruz River with bank protection to the east, and multi-family residences, and educational and commercial areas to the north. A Pima Community College building was being constructed just north of the landfill's northern boundary. As of April 30, the construction company, Kern Contractors, had not excavated any trash (they had excavated 5 feet down and 12 feet around their building site). They were planning to build a parking lot on the north side of the landfill just south of the building site.

Site 8
Location: T14S R13E, Section 11
Southeast corner of I-10 and St. Mary's Road, directly northwest of Quality Hotel & Suites
Field Description: No dumping or landfilling was evident at this site. The site consisted of a vacant lot east of I-10 with mesquite trees and large prickly pear cacti. Surface litter included paper, glass, and plastic bags. Access was available from Franklin Street and the I-10 off ramp. The surrounding land uses included I-10 to the west, commercial areas to the north, and a Quality Hotel & Suites to the southeast. This site was visited because it appeared to have been hummocky in the 1990 photograph.

Site 9
Location: T14S R13E, Section 11
Directly south of Franklin Street, approximately 200 feet north of Paseo Redondo, and approximately 50 feet east of I-10
Field Description: This site consisted of a minor wildcat dump on a vacant lot with mesquite and palo verde trees, a pit, and a large mound of dirt. Surface litter consisted of

a metal rod & wire, asphalt, bricks, concrete debris, and piles of dirt. Access was available from the parking lot west of Manning House on Paseo Redondo, but otherwise the site was enclosed by a chain link fence. The surrounding land uses included commercial areas to the south and east, I-10 to the west, and a Quality Hotel & Suites to the north.

Site 10

Rio Nuevo South Landfill (includes Congress and Nearmont Landfills)

Location: T14S R13E, Section 14
Approximately 200 feet south of Congress Street, approximately 100-200 feet east of Mission Road, and directly west of the Santa Cruz River

Field Description: Rio Nuevo South Landfill includes both Congress and Nearmont landfills. This site was graded with a drainage ditch running west to east along the northern edge of the site. Surface material included surface piles of dirt, concrete debris, bricks, and green waste directly north of the Congress Landfill. Surface litter included tin cans, plastic, glass, green waste and rubber tires along the western end of the site and in the drainage ditch along the northern side of the site. Access was available from Congress Street directly to the north. The surrounding land uses included a bus fueling station, residential areas, and the "A" Mountain Landfill to the south, commercial and residential areas to the north, the Santa Cruz River to the east, and residential areas to the west. Since PAG's last visit in the Spring of 1993, the surface of the Nearmont Landfill had been burned, and the drainage ditch along the northern edge of the landfill had been re-graded.

Site 11

"A" Mountain Landfill

Location: T14S R13E, Section 14
Southeast corner or Mission Road and Mission Lane, directly west of the Santa Cruz River

Field Description: "A" Mountain Landfill was located at this site and there was a major wildcat dump on the surface. PAG staff observed several wellheads (open and closed) on the site as well as two thin pipes protruding approximately 6 feet from the land surface. The surface material included partially buried rubber tires, old chairs and appliances (mostly on the northern edge of the site), and surface piles of concrete debris, rubber tires, glass, asphalt, plastic, cloth, paper, carpet, rubber, rebar, wood, tin cans, metal screening, cloth, concrete debris, and rubber throughout the site. Photograph #2 shows a 10-foot-by-10-foot area of wildcat dumping, which was representative of the concentration of surface material throughout the site. Access was available from Mission Road and Mission Lane by car; there was also a low post-and-cable fence that was part of the Santa Cruz River Park along the eastern edge of the site. The surrounding land uses included residential areas and the Rio Nuevo South Landfill to the north, "A" Mountain Park to the west, the Santa Cruz River Park to the east and south, and the Mission Landfill to the southwest. The surface was extremely hummocky and, according to a sign, there was an El Paso Gas

Site 13

Location: T14S R13E, Section 14
Approximately 1/2 mile south of Congress Street and directly east of Kroeger Lane

Field Description: This site consisted of a minor wildcat dump on a vacant lot with shallow drainages running approximately southeast-northwest and desert broom along with other vegetation. Waste seen on the surface included dirt piles, asphalt, rubber tires, office dividers, a few empty 55-gallon drums, one-gallon cans, carpet, concrete debris, paper, metal screening, aluminum foil, a plastic oil bottle, rusted cans, glass, plastic, cloth, brick, mattress springs, and a refrigerator. Photograph #3 shows an area of concentrated dumping in the center of the site. The waste on the rest of the site was more scattered. Access was available from Kroeger Lane. The surrounding land uses included vacant land to the west (Site 12), and residential areas to the east, south, and north.

Photograph 3. Wildcat dump in center of vacant lot at Site 13, view toward the northeast.

line at 39 feet below land surface. It was difficult to discern the amount of exposed buried material because there was so much surface material on the site.

Photograph 2. Wildcat dump on surface of "A" Mountain Landfill at Site 11, view toward the southeast.

Site 12

Location: T14S R13E, Section 14
Approximately 1/2 mile south of Congress Street, directly west of Kroeger Lane, and directly east of the Santa Cruz River

Field Description: The site consisted of a minor wildcat dump on a vacant lot with sparse vegetation located on the east bank of the Santa Cruz River. The waste seen on the surface included plastic bottles, piles of concrete debris, chair frames, cans, and a few empty 55-gallon drums. Access was available from Kroeger Lane. The surrounding land uses included the Santa Cruz River with bank protection to the west, a power substation, vacant and residential areas to the east, commercial areas to the north, and residential areas to the south.

Site 14

Location: T14S R13E, Section 14
Southeast of intersection of Kroeger Lane and 21st Street, and directly north of 22nd Street

Field Description: This site consisted of a disturbed, vacant lot with a minor wildcat dump in a well-vegetated (mesquite and other trees and shrubs) drainage running north-south on the eastern edge of the site. The waste seen on the site included dirt piles, cardboard, cloth, old chairs, paper, plastic bags and bottles, glass, asphalt, cloth, and concrete debris. The waste was concentrated in, or near, the drainage. Photograph #4 shows an area along the western bank of the drainage that represented the concentration of surface material within the drainage. There were also a large number of plastic bags and paper products that were probably blown onto the site. Access was available from Kroeger Lane. The surrounding land uses included residential areas to the west and north, commercial areas (hotels) to the east, and 22nd Street and vacant land to the south. The litter may have originated from open, poorly maintained dumpsters located east of the site. Several homeless encampments were also seen on the site.

Photograph 4. Wildcat dump in drainage at Site 14, view toward the north.

Site 15

Location: T14S R13E, Section 14
Approximately 50 feet west of Kroeger Lane, directly north of 22nd Street and directly south of 21st Street

Field Description: No dumping or landfilling was evident on this site. The site consisted of a disturbed, vacant lot with sparse vegetation just north of 22nd Street. Access was available from Kroeger Lane and 21st Street. The surrounding land uses included vacant land to the east and south, and residential areas to the north and west. This site was visited because it appeared to have been disturbed in the 1990 photograph.

Site 16

Mission Landfill

Location: T14S R13E, Section 14
Northeast corner of Starr Pass Blvd./22nd Street and Mission Road

Field Description: Mission Landfill was located at this site. After landfill closure, the site was converted to part of the Santa Cruz River Park. The landfill material was not exposed, so it was not possible to specify the types of material present. Access was available from Mission Road, but entrance to the site was possible only on foot or bicycle. The surrounding land uses included Sentinel Peak Park to the west and north, the Santa Cruz River with bank protection to the east, and county government land to the south. The site was hummocky, but this may have been due to grading of the site after the landfill was closed, rather than to differential settling. PAG staff did not see any change in the appearance of the site since the area had been visited in the Spring of 1993.

Site 17

Location: T14S R13E, Section 23
Southeast corner of 22nd Street and the Santa Cruz River

Field Description: This site consisted of a vacant lot on the east bank of the Santa Cruz River with sparse vegetation. The waste seen on the site (between 22nd Street and Santa Cruz Lane) included green waste and wood piles along the eastern edge of the Santa Cruz River directly east of 24th Street. Access was not possible because the site was surrounded by fenced private property. The surrounding land uses included residential areas to the east, the Santa Cruz River with bank protection to the west, 22nd Street and industrial areas to the north, and vacant land to the south.

Site 18

Location: T14S R13E, Section 23
Southeast corner of 22nd Street and Santa Cruz Lane

Field Description: This site consisted of a minor wildcat dump on a large, disturbed, slightly hummocky vacant lot south of 22nd Street with sparse vegetation. The surface litter included rubber tires, plastic, cloth, and paper. There was no visible evidence of buried waste. Access was available from Santa Cruz Lane and 24th Street. The surrounding land

uses included residential areas to the west and south, commercial areas to the east, and vacant land and 22nd Street to the north. There was an old concrete building foundation on the southwestern corner of the site.

Site 19

Location: T14S R13E, Section 23
Approximately 1/5 mile south of Silverlake Road, 1/3 mile east of the Santa Cruz River, and directly north of El Puente Lane

Field Description: This site consisted of a minor wildcat dump on a vacant lot with mounds of dirt and palo verde and mesquite trees. The waste seen on the surface included rubber tires, piles of concrete debris, bricks, wood, and asphalt. Access was available from the parking lot and the 1/4 mile driveway at 947 W. Silverlake. The surrounding land uses included commercial areas to the west, an auto recycling plant to the north, a small drainage and vacant land to the east, and vacant land to the south.

Site 20

Location: T14S R13E, Section 23
Directly south of Silverlake Road, running along both banks of the Santa Cruz River for approximately 3/4 mile

Field Description: This site consisted of an active sand and gravel operation, Ace Sand & Gravel, encompassing both sides of the Santa Cruz River south of Silverlake Road (no bank protection along river). The material seen on the site from Cottonwood Lane, 200 feet west of the site, included piles of concrete debris and bricks. Access was not available; the property was private and surrounded by chain link fence. The surrounding land uses included dormant farmland and mobile home parks to the west; commercial areas and vacant land to the east; vacant land to the south; and industrial, vacant, and residential land to the north.

Site 21

29th Street Landfill

Location: T14S R13E, Section 23
Approximately 1/3 mile north of Silverlake Road directly south of the West Branch Confluence

Field Description: 29th Street Landfill was located at this site. However, no access was available because Pima County Parks and Recreation, Pima County's garage and storage areas, and the Pima County Sheriffs Department training area were built over the site after the landfill was closed. The landfill was not exposed and the property was surrounded by a chain link fence. The surrounding land uses included a prison and industrial land to the south, the Santa Cruz River with bank protection to the east, and the West Branch of the Santa Cruz River with partial bank protection to the west and north.

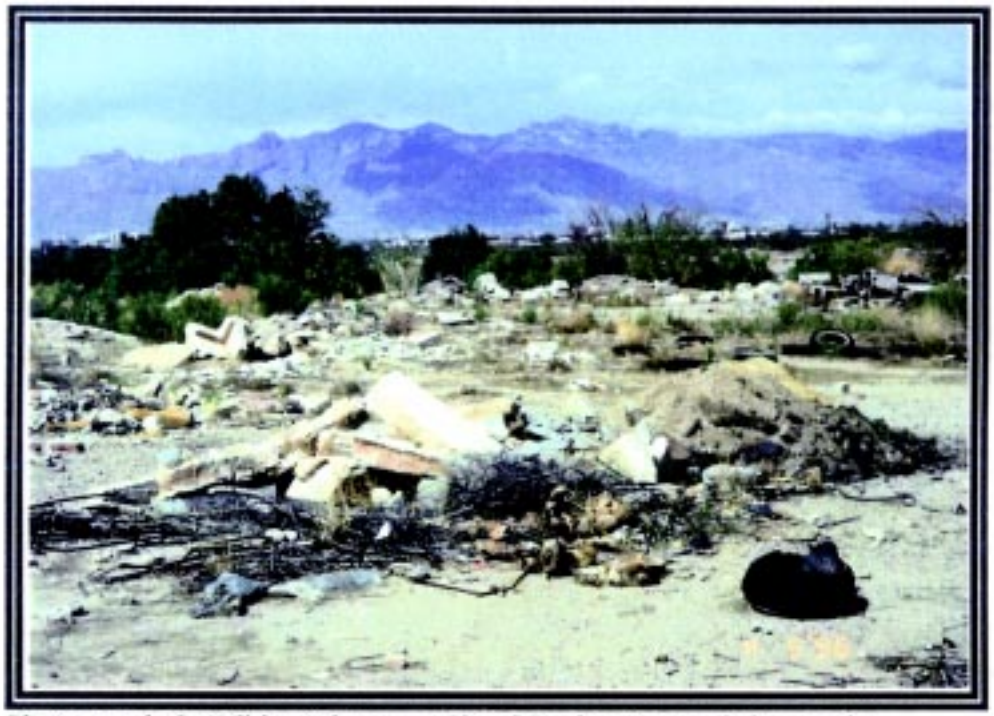
Site 22
Ryland Landfill
Location: T14S R13E, Section 26
West of I-10/I-19 intersection on east bank of Santa Cruz River
Field Description: Ryland Landfill was located at this site. The landfill material exposed along the river bank included glass, cans, paper, wood, plastic, concrete and asphalt debris, bricks, rubber tires, newspaper, and household waste. Photograph #5 shows most of the bank edge of the landfill. Rubber tires were also seen on the surface of the landfill. Access was available from Ajo Way along a dirt road. The surrounding land uses included the river with no bank protection to the west, I-19 to the east, and vacant lots to the north and south. The surface of the landfill was extremely hummocky, which was probably due to differential settling. PAG staff did not see any change in the appearance of the site since the area had been visited in the Spring of 1993.

Photograph 5. Bank edge of Ryland Landfill at Site 22, view toward the southeast.

Site 23

Location: T14S R13E, Section 26
Northeast corner of Ajo Way and Cottonwood Lane on west bank of Santa Cruz River

Field Description: This site consisted of a minor wildcat dump on a vacant lot, approximately 1/4 mile long and 200 feet wide, located on the west bank of the Santa Cruz River with desert broom and grasses. The waste seen on the site included piles of concrete debris, metal, rubber tires, glass, brick, oil filters, dirt and a washing machine. Photograph #6 shows an area of concentrated dumping, in the foreground, located in the center of the site. The waste on the rest of the site was more scattered, such as the waste in the background of the photograph. Access was available from dirt paths off Cottonwood Lane. The surrounding land uses included the river with no bank protection on the east, a gravel pit to the north, and residential areas to the west and south.



Photograph 6. Wildcat dump at Site 23, view toward the north.

Site 24
Small Gravel Pit
Location: T14S R13E, Section 26
Southeast corner of Cottonwood Lane and 44th Street alignment on west bank of Santa Cruz River
Field Description: This site consisted of a gravel pit on the west bank of the Santa Cruz River. The waste seen on the site included piles of brick and concrete debris. Access was not possible because the site was fenced by a high chain link fence with interwoven wood strips. The surrounding land uses included a mobile home park to the west, residential areas to the north, the Santa Cruz River with no bank protection to the east, and a mobile home park and vacant land to the south.

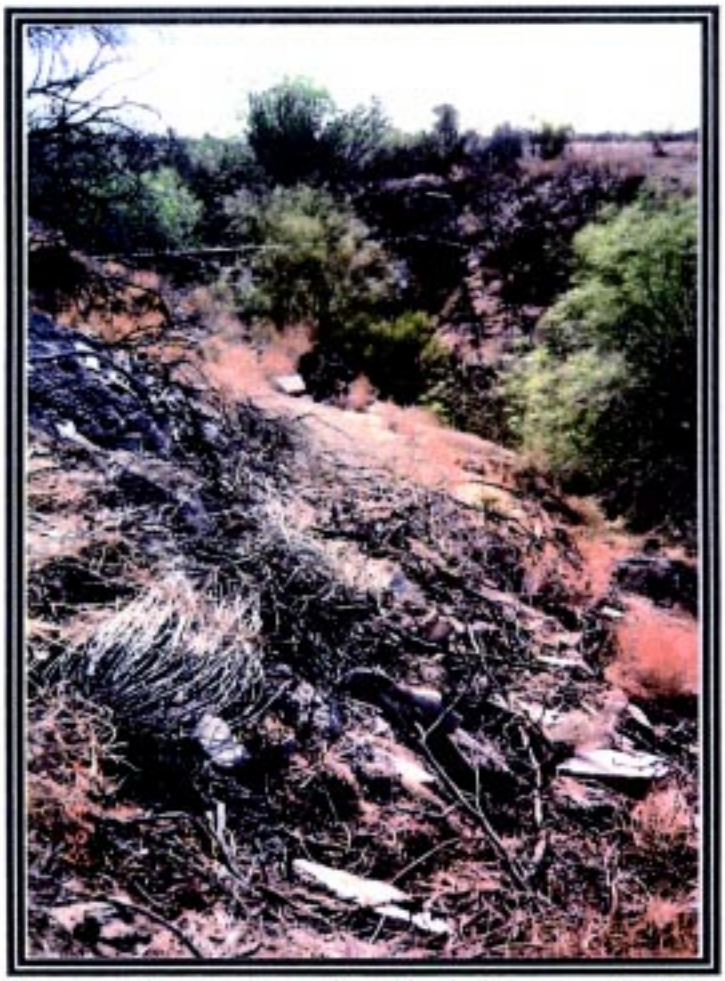
Site 25
Cottonwood Landfill
Location: T14S R13E, Section 26
Northwest corner of Cottonwood Lane and 44th Street alignment on west side of Santa Cruz River
Field Description: Cottonwood Landfill was located at this site. Historical aerial photographs indicated that the site had been developed for residential use between 1990 and the present. PAG staff observed that approximately six mobile homes had been built on top of the landfill site. There appeared to have been methane monitoring wells around the perimeter of the site. The surrounding land uses included residential areas to the south, north, and east, and agricultural areas to the west. Access was possible from Cottonwood Lane. There was no evidence of recent dumping.

Site 26
Location: T14S R13E, Section 35
At the southwest corner of Ajo Way and Kostka Ave. on east bank of Santa Cruz River
Field Description: No dumping or landfilling was evident at this site. The site consisted of a vacant lot east of the Santa Cruz River Park. There were creosote bushes and other desert brush vegetation on site. Access was available from Kostka Avenue; however, there was no road onto the site, which was surrounded by a low post-and-cable fence. The surrounding land uses included a recreational park and residential land and there was bank protection. The surface was somewhat hummocky, but there was no evidence of buried waste. This site was visited because it appeared to have been hummocky in the 1990 photograph.

Site 27

Location: T14S R13E, Section 35
Southeast of Kostka Ave. - Michigan St. intersection on east side of Santa Cruz River and south of a Tucson Water well

Field Description: This site consisted of a minor wildcat dump in a drainage east of the Santa Cruz River. The waste seen on the site included piles of green waste, concrete debris, bricks, cans, bottles, and empty 55-gallon drums. Photograph #7 shows an area of concentrated dumping along the northern bank of the drainage. The waste on the rest of the site was more scattered. Access was available from the empty lot located south of Michigan Street on the northern side of the drainage. The surrounding land uses included vacant land, residential land, and a Tucson Water well to the north (#SS-12); residential land to the east; vacant land to the south; and recreational park to the west.



Photograph 7. Wildcat dump in drainage at Site 27, view toward the east.

Site 28

Location: T14S R13E, Section 35
Between Ajo Way and Irvington Road on west bank of Santa Cruz River and east and south of mobile home parks

Field Description: This site consisted of a minor wildcat dump on a large vacant lot with mature mesquite trees, desert broom, and grasses. The northern third of the site was investigated on foot and the following features were identified: old building foundations on the east and west sides of the area; old concrete towers (measuring approximately 25 to 30 feet high and 15 feet in diameter) on the east side; and a somewhat hummocky surface. The material identified around the old foundations on the northern third of the site included: green waste; small rusted cans; old wood; concrete debris; bottle glass; and metal screening. The southern two-thirds of the site was checked by driving roads located in a mobile home park to the west of the site. PAG staff observed that the southern two thirds of the site consisted of a large disturbed area with piles of dirt and some glittery debris (probably glass). Access was possible on foot, but not by car, because the entrance at the north end of the site was blocked by a short fence. The surrounding land uses included mobile home parks to the north and west and the Santa Cruz River Park with bank protection to the east and south. In the mobile home park to the north, there was a trash collection area for the residents that included dumpsters and piles of concrete and asphalt debris, wood, and brick. The waste around the building foundations on the site could have resulted from the demolition of the buildings.

Site 29

Location: T14S R13E, Section 35
Northwest corner of intersection of Midvale Park Road and the Santa Cruz River

Field Description: No dumping or landfilling was evident at this site. The site consisted of a disturbed vacant lot with piles of dirt and some vegetation, including desert broom and mesquite trees. There was surface litter present. Access was not possible by car. The surrounding land uses included a man-made drainage channel to the north, multi-family residential property to the west, vacant lots to the south, and the Santa Cruz River Park to the east. This site was visited because it appeared to have been disturbed in the 1990 photograph.

Site 30

Location: T14S R13E, Section 35
Northwest corner of I-19 and Midvale Park Road/Irvington Road and east of Santa Cruz River

Field Description: No dumping or landfilling was evident on this site. The site consisted of a large rectangular lot that, according to several signs posted on buildings and fencing, was used by Tucson Water for a treatment plant and storage of tanks and pipes. Access by car was available from Irvington Road to the south, but the site was fenced and was most likely closed at night. The surrounding land uses included vacant lots to the north and south, the Santa Cruz River Park with bank protection to the west, and I-19 to the

east. This site was visited because it had been noted in PAG's 1992 report to be an old landfill.

Site 31

Location: T15S R13E, Section 2
Southwest corner of Midvale Park Road and Calle Santa Cruz on east bank of Santa Cruz River

Field Description: No dumping or landfilling was evident at this site, although evidence could have been eroded away. The site was a vacant lot adjacent to the Santa Cruz River with 20-foot cliffs along the river. Access was available on foot from Calle Santa Cruz, but there was no access for vehicles due to the high curb along the road. The surrounding land uses included vacant lots on the north, east, and south sides, and the river with no bank protection on the west. This site was visited because there appeared to have been rubble along the river bank in the 1974 photograph.

Site 32

Location: T15S R13E, Section 2
South of Irvington Road on west bank of Santa Cruz River

Field Description: This site consisted of a vacant lot, measuring approximately 300 feet wide by 1/3 mile long, on the west bank of the Santa Cruz River. The waste seen on the site included concrete debris on top of the bank and wood piles near the bottom of the bank within the floodway. Access was not available by road, so it was necessary to make observations from the east bank of the Santa Cruz River. The surrounding land uses included vacant lots on the north, south, and west sides, and the river with no bank protection on the east side.

Site 33

Location: T15S R13E, Section 2
West of Calle Santa Cruz and approximately 1/2 mile north of Drexel Road, on east bank of Santa Cruz River

Field Description: This site consisted of a minor wildcat dump on a vacant lot, measuring approximately 1/4 mile long and 150 feet wide, on the east bank of the Santa Cruz River with desert broom. The waste seen on the site included 10 rubber tires, several small cans of various types and broken glass. Access was available along Calle Santa Cruz, but the high curb prevented vehicles from driving onto the site. The surrounding land uses included vacant lots to the north, west, and south, and the Santa Cruz River with no bank protection to the east.

Site 34
Drexel Road Area
Location: T15S R13E, Section 11
Southwest corner of Drexel Road and Calle Santa Cruz on east bank of Santa Cruz River

Field Description: This site consisted of a major wildcat dump along the edge of a vacant lot. It encompassed two drainages and the intervening section of river bank on the east side of the Santa Cruz River. The disposal area was located a few hundred feet west of Calle Santa Cruz and was hidden from the road by trees and bushes. The dump appeared to have been primarily on the surface, not buried. The drainage on the southern edge of the site contained piles of wood, brick, carpet, towels, tiles, metal, clothing, asphalt, rubber tires, and shoes. Brick, concrete debris, miscellaneous scrap metal, and wood piles were identified along approximately 200 feet of the river bank down to the river bed. Photograph #8 shows an area of dumping in the southern drainage that indicates the density of waste in that drainage. Photograph #9 shows the representative concentration of waste on top of the wildcat dump. The drainage north of the site was clean, except for a buried tire and concrete debris with rebar protruding from it. Access was available from Calle Santa Cruz into the vacant lot and recent tire tracks were observed in a large cleared area east of the bank. The surrounding land uses included vacant lots to the north and south, the river with no bank protection to the west, and a commercial and industrial area to the east.

Photograph 8. Drainage at southern edge of wildcat dump at Site 34, view toward the southwest.

Photograph 9. Piles of dirt and concrete debris along the western perimeter of a wildcat dump directly east of Santa Cruz River at Site 34, view toward the west-northwest.

Site 35

Location: T15S R13E, Section 11
Northwest corner of Valencia Road and Calle Santa Cruz on east bank of Santa Cruz River

Field Description: No dumping or landfilling was evident at this site. The site consisted of a disturbed vacant lot with desert broom on the east bank of the Santa Cruz River. Access was available by foot from Calle Santa Cruz, but the curb was too high for vehicles to access the site. The surrounding land uses included the Santa Cruz River with bank protection to the west, vacant lots to the north and east, and the San Xavier Rock & Materials sand and gravel operation to the south. Minor surface litter was observed.

Site 36

Location: T15S R13E, Section 10
On west bank of Santa Cruz River between Drexel Road alignment and Valencia Road

Field Description: This site consisted of a vacant lot, measuring approximately 1/2 mile long by 300 feet wide, that seemed to have been unofficially used as an off-road vehicle recreational area. The waste seen on the site included piles of dirt and concrete debris along the river bank. Access was available from Commerce Court and was well-travelled.

The surrounding land uses included the river with no bank protection and a major drainage to the east, a residential area to the west and south, and vacant lots to the north. The drainages surrounding the site were clean with no bank protection.

Site 37

Location: T15S R13E, Section 11
On west bank of Santa Cruz River north of Valencia Road and east of Commerce Court

Field Description: This site consisted of a vacant lot, measuring approximately 1/3 mile long by 250 feet wide, containing three waste disposal areas that constitute a major wildcat dump. At the southern end of the site, PAG observed a pile of carpet, wood, metal pipes, tiles, cardboard, and rubber. Farther to the north, tarps, cardboard, motor oil cans, carpet, WD40 spray cans, rubber tires, anti-freeze, and scrap metal were identified. At the northern end of the site, an old, partially-buried wildcat dump was seen beside, and within, a tributary drainage of the Santa Cruz River. The waste was identified in an area measuring approximately 200 feet-by-100 feet, and consisted of rusted cans, old shoes, glass, wood, concrete and asphalt debris, rubber tires, plastic, rubber, bedsprings, cloth, and aluminum foil. Photograph #10 shows an area with a concentrated amount of waste in the center of the site. Natural runoff processes may have contributed to the burial of the trash. Access to these sites was available from Valencia Road, via dirt trails large enough for vehicles. The surrounding land uses included a residential area, a hospital, and a minor drainage to the west, the river with bank protection to the east, and vacant lots to the north and south.

Photograph 10. Wildcat dump at Site 37, view toward the northwest.

Site 38

Location: T15S R13E, Section 3
Just north of Drexel Road alignment on west bank of Santa Cruz River

Field Description: No dumping or landfilling was evident at this site. The site consisted of a vacant lot on the west bank of the Santa Cruz River and to the north of an east-west drainage that separated it from Site 36. Access was available from Wembly Road in the residential area to the west, but it was possible to visually check the site from Site 36 to the south. The surrounding land uses included vacant lots to the north and south, the river with no bank protection to the east, and a residential area to the west. The bank on the east side of the site was eroded. This site was visited because there appeared to have been rubble and piles of material on site in the 1990 photograph.

Site 39

Location: T15S R13E, Section 2
Between Midvale Park Road and Drexel Road alignment on west bank of Santa Cruz River and east of Wembly Road

Field Description: No dumping or landfilling was evident on this site. The site consisted of a vacant lot, measuring approximately 1/5 mile long by 100 feet wide, along the west bank of the Santa Cruz River. Rip-rap along the bank was probably being used as bank protection. Access was not available by car or foot, so the site was visually checked from the other side of the river. The surrounding land uses included the river with minimal bank protection to the east, a residential development to the west, and vacant lots to the north and south.

Site 40

Location: T15S R13E, Section 10
West of Wal-Mart on northwest corner of Midvale Park Road and Valencia Road, east of Oaktree Drive, and approximately 1/2 mile west of the Santa Cruz River

Field Description: No dumping or landfilling was evident on this site. The site consisted of a disturbed, vacant lot with sparse grasses. Access was available from Valencia Road, Oaktree Drive, and the nearby parking lots. The surrounding land uses included a Wal-Mart to the west, industrial and commercial properties to the south, a vacant lot to the north, and a commercial strip mall to the east. Paper and plastic products, which were probably blown onto the site from the adjacent parking lots, were present on the site. This site was visited because it appeared to have been disturbed in the 1990 photograph.

Site 41

Location: T15S R13E, Section 10
Approximately 1/2 mile west of the Santa Cruz River, approximately 1/2 mile north of Valencia Road, and east of Oaktree Drive

Field Description: This site consisted of a minor wildcat dump on a large vacant lot (old farmland) with grasses. The waste seen on the site included dirt piles, green waste, large tree segments, concrete debris and scrap metal. Access was available from Oaktree Drive

to the west. The surrounding land uses included new residential areas to the north and west, a vacant lot and commercial land to the south, and a vacant lot to the east.

Site 42

Location: T15S R13E, Section 14
Southwest corner of I-19 and Valencia Road on east bank of Santa Cruz River

Field Description: No dumping or landfilling was evident at this site. The site consisted of an old gravel pit (San Xavier Rock & Material) located on the east bank of the Santa Cruz River that was devoid of vegetation and contained some dirt piles. Access was not available because the site was fenced with chain link and barbed wire. The surrounding land uses included a vacant lot to the north, I-19 to the east, the river with bank protection to the west, and an active sand and gravel operation to the south. A minor drainage southeast of the site had some glass, cans, cardboard, and plastic bags in it. This site was visited because the pit appeared in the 1974 photograph.

Site 43

Location: T15S R13E, Section 14
Directly south of Site 17, west of I-19, east of Santa Cruz River, and halfway between Valencia Road and Los Reales Road alignment

Field Description: This site consisted of an active sand and gravel operation (San Xavier Rock & Materials) on the east bank of the Santa Cruz River. Several tailings ponds were located on site, one of which had become a marsh. The waste seen surrounding the tailings pond that had become a marsh included concrete debris and wood. Access was restricted because it was fenced private property and only sand and gravel trucks were allowed to enter. The surrounding land uses included old sand and gravel operations (with the same company) to the north and south, the river with bank protection to the west, and I-19 to the east.

Site 44

Location: T15S R13E, Section 14
Directly south of Site 18, west of I-19, east of Santa Cruz River, and north of Los Reales Road alignment

Field Description: This site consisted of an old sand and gravel operation (San Xavier Rock & Material) on the east bank of the Santa Cruz River. There could have been some piles of dirt and concrete debris, but it was not possible to access the site to verify the observations made from the highway. Access was not available because the road was fenced off and there was a "No Trespassing" sign. Vegetation growing up through cracks in the asphalt indicated that the access road had not been used extensively for some time. The surrounding land uses included an active sand and gravel operation to the north, I-19 to the east, the river with bank protection to the west, and a vacant lot to the south.

Site 45

Location: T15S R13E, Section 14
Alley south of, but coincidental with, the Pinta Avenue alignment east of I-19 between Valencia Road and Los Reales Road

Field Description: This site consisted of a vacant lot east of I-19 and west of the alley coincidental with the Pinta Avenue Alignment. The site contained a minor wildcat dump near a drainage at the northern edge. The waste seen on the site consisted of dirt, green waste, rubber tires, concrete debris and wood piles. Access to the side of the site was available from the alley that coincided with the Pinta Avenue Alignment, although there was a short barbed wire fence. The surrounding land uses included I-19 to the west, a residential area to the east and south, and a vacant lot to the north.

Site 46

Location: T15S R13E, Section 22
Approximately 200 feet north of San Xavier Loop Road and approximately 1/4 mile west of the Santa Cruz River

Field Description: No dumping or landfilling was evident at this site. The site consisted of abandoned farmland 200 feet north of San Xavier Loop Road with farm machinery and stacked hay bales. There were a few scattered glass bottles and metal cans on the surface. Access was not possible because the site was private property and it was enclosed by a barbed wire fence. The surrounding land uses included active and abandoned farmland to the west, east, and south, and residential land and abandoned farmland to the north. This site was visited because it appeared to have been disturbed in the 1990 photograph.

Site 47

Location: T15S R13E, Section 22
Approximately 1/2 mile north of San Xavier Loop Road and approximately 1/4 mile west of the Santa Cruz River

Field Description: No dumping or landfilling was evident at this site. The site consisted of a vacant lot 1/2 mile north of San Xavier Loop Road that had been farmland at one time, but now contained only sparse vegetation. Access was not possible because the site was private property and it was enclosed by barbed wire fencing. The surrounding land uses included abandoned farmland to the east, north, and south, and residential land to the west. This site was visited because it appeared to have been disturbed and appeared to have contained rubble piles in the 1990 photograph.

Site 48

Location: T15S R13E, Section 22
Approximately 1 mile north of San Xavier Loop Road and directly west of the Santa Cruz River

Field Description: This site contained a major wildcat dump within a drainage and a 300-foot section (approximate) of the river bank. Most of the drainage was essentially clean. The site was located directly west of the Santa Cruz River approximately one mile north of

San Xavier Loop Road, and had mesquite and palo verde trees and grasses. The material seen on the site included piles of asphalt, bricks, scrap metal strips, roofing materials, a paint can, rubber tires, an old car, old corrugated pipes, glass, an old water heater, old stoves, carpet, concrete debris, metal cans, wire, a 5-gallon can of roof cement, an empty 55-gallon metal drum, and wood. Photograph #11 shows an area on the eastern edge of the site containing more concentrated waste than the rest of the wildcat dump. Access was available from Oidak Wo:g. The surrounding land uses included abandoned farmland to the north, west, and south, and the Santa Cruz River with minor bank protection to the east.

Photograph 11. Wildcat dump at Site 48, view toward the southwest.

Site 49

Location: T15S R13E, Section 22
Approximately 1/2 mile north of San Xavier Loop Road and approximately 1/3 mile west of the Santa Cruz River

Field Description: The site consisted of a private car parts storage area approximately 1/2 mile north of San Xavier Loop Road and a minor wildcat dump in a drainage directly to the west. The waste seen on the site was primarily in the drainage and included piles of metal cans, glass bottles, plastic, carpet, a toilet, old appliances, a large metal water tank, and corrugated cardboard. Access was available from Oidak Wo:g. The surrounding land uses included abandoned farmland to the west, east, and north, and residential property to the south.

Site 50

Location: T15S R13E, Section 22
Northwest corner of San Xavier Loop Road and the Santa Cruz River

Field Description: No dumping or landfilling was evident at this site. The site consisted of a well-vegetated vacant lot directly west of the Santa Cruz River and directly north of San Xavier Loop Road. Access was not available because the site was enclosed by a barbed wire fence. The surrounding land uses included the Santa Cruz River with bank protection to the east, active farmland to the west and south, and abandoned farmland to the north. This site was visited because the site appeared to have been hummocky in the 1974, 1990, and 1995 photographs.

Site 51

Location: T15S R13E, Section 27
Approximately 1 mile south of San Xavier Loop Road, 1/4 mile east of Little Nogales Drive, 3/4 mile west of I-19, and directly north of Campus Drive

Field Description: No dumping or landfilling was evident at this site. The site consisted of a drainage, located directly north of Campus Drive, with grasses and mesquite trees. Access was available from Campus Drive. The surrounding land uses included abandoned farmland to the east, and residential land and natural desert to the west, north and south. This site was visited because there appeared to have been hummocky topography in the photographs caused by factors other than surface runoff eroding the site.

Site 52

Location: T15S R13E, Section 26
Approximately 1/2 mile east of I-19 and 1.5 miles south of San Xavier Loop Road on west bank of the Santa Cruz River

Field Description: The site consisted of a minor wildcat dump on a portion of the river bank east of I-19 and along the west bank of the Santa Cruz River. The waste seen at this site included glass bottles, plastic cups, 12-pack beer boxes, aluminum beer cans, wire, oil filters and cans, as well as partially buried metal cans, rubber and rubber tires. Photograph #12 shows waste in the center of the site that is more concentrated than the waste on the rest of the site. Access was available from the eastern terminus of Campus Drive. The surrounding land uses included abandoned farmland to the west, natural desert to the north and south, and the Santa Cruz River with no bank protection to the east.

Photograph 12. Wildcat dump at Site 52, view toward the southeast.

Site 53
Water Tank
Location: T15S R13E, Section 34
Approximately 1/2 mile west of I-19, 1/2 mile east of San Xavier Road, and 1/2 mile south of Campus Drive on Little Nogales Drive
Field Description: No dumping or landfilling was evident at this site. The site consisted of a clearing with a water tank in the center approximately 3/4 mile west of I-19. Access was available from Little Nogales Drive. The surrounding land uses included natural desert and grazing land. This site was visited because the clearing and the dirt roads around the water tank appeared to have been well-travelled in the 1974, 1990, and 1995 photographs, which indicated the possibility of wildcat dumping on the site.

Site 54
Location: T15S R13E, Section 34
Approximately 1/5 mile north of Papago Road and directly west of I-19 at southern terminus of Little Nogales Drive
Field Description: No dumping or landfilling was evident at this site. The site consisted of a disturbed area directly west of I-19, surrounded by less-disturbed desert. Access was available from Little Nogales Drive and there was barbed wire along the eastern edge of the site. The surrounding land uses included natural desert and grazing land to the north, west, and south, and I-19 to the east. This site was visited because the vegetation

appeared to have been more disturbed than the surrounding desert in the 1974, 1990, and 1995 photographs.

Site 55

Location: T16S R13E, Section 3
Southwest corner of Papago Road and I-19

Field Description: No dumping or landfilling was evident at this site. The site consisted of slightly disturbed desert directly west of I-19 at the Papago Road extension. Access was available from Little Nogales Drive and other unnamed dirt roads. The surrounding land uses included natural desert and grazing land to the north, west, and south, and I-19 to the east. This site was visited because it appeared to have been disturbed on the 1974, 1990, and 1995 photographs.

Site 56

Location: T15S R13E, Section 23
Approximately 3/4 mile north of San Xavier Loop Road, directly west of I-19 and in, or along, the east bank of the Santa Cruz River

Field Description: The site consisted of a major wildcat dump with excavated pits and piles of dirt in the floodway of the Santa Cruz River northwest of Martinez Hill. The waste seen on the site included concrete debris and metal pylons, and piles of dirt with old rubber car tires, steering wheels, and bumpers that appeared to have been dated from the 1940's. Photograph #13 shows piles of concrete debris, metal, and dirt that were representative of the rest of the site. Some of the waste had been buried, probably by natural deposition within the river channel. Access was available from two dirt roads directly west of I-19 and directly north of San Xavier Loop Road. The surrounding land uses included the Santa Cruz River to the west, north and south with riprap bank protection, and I-19 and vacant land to the east.

Photograph 13. Piles of concrete debris, dirt, and metal at Site 56, view toward the northwest.

Site 57

Location: T15S R13E, Section 23
Approximately 1/2 mile north of San Xavier Loop Road, directly west of I-19 and directly east of the Santa Cruz River

Field Description: The site consisted of a major wildcat dump on a portion of the river bank along the east side of the Santa Cruz River with mesquite and palo verde trees, desert broom, and grasses. The waste seen on the site included mainly intact and partially-buried old cars possibly dating from the 1940's; there were also piles of wire, wood, metal cans, metal springs, rubber tires, a muffler, rebar, dirt, glass, oil filters, concrete blocks, a car bench seat, and a vehicle gas tank. Photograph #14 shows piles of waste on the eastern edge of the site that were representative of the waste on the rest of the site. Access was available from two dirt roads directly west of I-19 and directly north of San Xavier Loop Road. The surrounding land uses included the Santa Cruz River with riprap bank protection to the west, north, and south, and vacant land and I-19 to the east.

Photograph 14. Wildcat dump at Site 57, view toward the northeast.

Site 58

Location: T15S R13E, Section 26
Approximately 1/2 mile east of the Santa Cruz River and 1.5 miles south of Martinez Hill

Field Description: The site consisted of a vacant lot with sparse vegetation, located 1.5 miles south of Martinez Hill. Piles of dirt were the only waste materials seen on the site. Access was available from dirt roads originating at JJ Stock Road and the San Xavier Health Clinic. The surrounding land uses included natural desert and a few scattered residences.

Site 59

Location: T15S R13E, Section 26
Approximately 200 feet east of the Santa Cruz River and 1 mile south of Martinez Hill

Field Description: No dumping or landfilling was evident at this site. The site consisted of flat, vegetated vacant land 200 feet east of the Santa Cruz River. Access was available from dirt roads originating at JJ Stock Road and the San Xavier Health Clinic. The surrounding land uses included natural desert to the south, the Santa Cruz River with no bank protection to the west, and rural residential areas to the north and east. Ponding may have occurred at this site in the past, because flat ground, desiccation cracks, and tall grasses were seen on site. This site was visited because it appeared to have been hummocky on the 1974, 1990, and 1995 photographs.

Site 60

Location: T15S R13E, Section 23
Approximately 1/4 mile east of the Santa Cruz River and directly south of Martinez Hill

Field Description: No dumping or landfilling was evident at this site. The site consisted of a small clearing directly south of Martinez Hill with a burnt prickly pear cactus in the center. Access was available from dirt roads originating at JJ Stock Road and the San Xavier Health Clinic. The surrounding land use included natural desert on all sides. This site was visited because the dirt road leading to the clearing appeared to have been well-travelled in the 1990 and 1995 photographs, which indicated the possibility of dumping on the site.

Site 61

Location: T15S R13E, Section 23
Approximately 200 feet south of JJ Stock Road and approximately 200 feet southeast of the San Xavier Health Clinic

Field Description: The site consisted of a minor wildcat dump on a vacant lot directly southeast of the San Xavier Health Clinic with palo verde and mesquite trees. The waste seen on the site included piles of concrete debris with rebar, bricks, green waste, and dirt. Access was possible from JJ Stock Road and a dirt road southeast of the Clinic. The surrounding land uses included natural desert to the south, east, and west, and the Clinic to the north and northwest.

Site 62

Location: T15S R13E, Section 35
Approximately 3/4 mile east of I-19 and 2 miles south of Martinez Hill on the west bank of the Santa Cruz River

Field Description: The site consisted of a minor wildcat dump in a cleared area, measuring approximately 1/4 mile long by 100 feet wide, that was located directly west of the Santa Cruz River and directly north of a large flood diversion berm, which measured approximately four feet high. The material seen on the site included surface piles of concrete debris, large corrugated piping, metal, wood, barbed wire, red clay piping, glass bottles, green waste, dirt, and cobbles. Access was available from dirt roads originating near the eastern end of Campus Drive. The surrounding land uses included natural desert to the north and west, a flood diversion berm to the south, and the Santa Cruz River with no bank protection to the east.

Site 63

Location: T16S R13E, Section 2
Southwest corner of Papago Road and I-19

Field Description: Access was not possible due to barricades and fencing at the eastern terminus of Papago Road. The site appeared to have contained abundant mesquite and palo verde trees with no large clearings. The surrounding land uses included I-19 to the west and natural desert to the north, east, and south.

Site 64

Location: T16S R13E, Section 25
Approximately 1/3 mile north of Pima Mine Road and directly west of the San Xavier District's eastern boundary

Field Description: The site consisted of a minor wildcat dump in a cleared area at the intersection of a dirt road and a berm approximately 1/3 mile north of Pima Mine Road. The waste seen on the site included a surface pile of glass bottles, as well as a few plastic bottles and a wooden crate. Access was available from the dirt road that runs perpendicular to Pima Mine Road just west of the eastern boundary of the San Xavier District. The surrounding land uses included District grazing lands to the north, south, and west, and private grazing lands to the east.

Site 65

Location: T16S R13E, Section 25
Approximately 1.25 miles north of Pima Mine Road and directly west of the San Xavier District's eastern boundary

Field Description: No dumping or landfilling was evident at this site. The site consisted of an approximately 200-foot wide drainage located approximately 1.25 miles north of Pima Mine Road. The site contained some ponding as well as cholla cacti, mesquite trees, and grasses. Access was available from the dirt road that runs perpendicular to Pima Mine Road just west of the eastern boundary of the San Xavier District. The surrounding land uses included District grazing lands to the north, south, and west, and private grazing lands to the east. This site was visited because the dirt road leading to the site appeared to have been well-travelled on the 1990 and 1995 photographs, indicating the possibility of dumping on the site.

Site 66

Location: T16S R13E, Section 24
Approximately 2 miles north of Pima Mine Road and directly west of the San Xavier District's eastern boundary

Field Description: No dumping or landfilling was evident at this site. The site consisted of a clearing directly south of Lee Moore Wash and approximately two miles north of Pima Mine Road with mesquite trees and heavily-grazed grasses. Access was available from the dirt road that runs perpendicular to Pima Mine Road just west of the eastern boundary of the San Xavier District. The surrounding land uses included District grazing lands to the north, south, and west, and private grazing lands and a cattle corral to the east. This site was visited because the dirt road leading to the site appeared to have been well-travelled on the 1990 and 1995 photographs, indicating the possibility of dumping on the site.

Site 67

Location: T16S R13E, Section 14

Approximately 2.5 miles north of Pima Mine Road and 200 feet east of I-19

Field Description: Access was not possible due to the topography and the fencing along I-19 to the west of the site. There were some clearings evident from I-19, but it was unclear whether they were on the site. The surrounding land uses included District grazing lands to the east, south, and north, and I-19 and grazing land to the west.

Site 68

Location: T16S R13E, Section 11

Approximately 3.5 miles north of Pima Mine Road and 200 feet east of I-19

Field Description: Access was not possible due to the topography and the fencing along I-19 to the west of the site. There were a few clearings evident from I-19, but it was unclear whether they were on the site. The surrounding land uses included District grazing lands to the east, south, and north, and I-19 and grazing land to the west.

CONCLUSIONS

The site information in this report provides an overview of waste disposal locations and materials. The project focused on identifying previously undocumented wildcat dumps and landfills within the flood plain of the Santa Cruz River. The study area extended from Grant Road to the north to Pima Mine Road to the south. Because the study area included tribal lands of the San Xavier District, PAG and OEM staff coordinated with the San Xavier District Office prior to scheduling the site visit. Permission to access the District lands was granted at the San Xavier Tribal Council meeting in May 1996.

Previously Undocumented Waste Disposal Sites

PAG staff identified 106 sites as possible waste disposal sites through analysis of aerial photographs of the Santa Cruz River area. The surfaces of the previously documented landfills, which are described in the "Previously Documented Landfills" section of this report, were included in the total number of sites. PAG staff field checked 68 of these sites, including the landfills, and noted whether they were clean or showed evidence of waste disposal. Sites were not visited if they were either outside the flood plain or were inaccessible by road.

Six (6) major waste disposal sites were identified in the study area. A "major" waste disposal site was defined as a wildcat dump or undocumented landfill with large piles of waste that were probably dumped by pickup trucks or larger vehicles. One of the major wildcat dumps (site 11) was located on the surface of "A" Mountain Landfill, just south of Mission Lane. All of the other major wildcat dumps identified in this study were located between Drexel Road and the San Xavier Loop Road. Two major sites (34 and 37) were located near the Santa Cruz River within the City of Tucson Boundaries. Three major sites (48, 56, and 57) were located within the San Xavier District near the northeastern border of tribal lands. All of these sites contained piles of dirt, concrete, or green waste in addition to the dumped trash.

Seventeen (17) minor waste disposal sites (9, 12, 13, 14, 18, 19, 23, 27, 28, 33, 41, 45, 49, 52, 61, 62, and 64) were identified in the study area. A "minor" waste disposal site was defined as a wildcat dump or undocumented landfill which consisted mostly of scattered surface litter which would at the most be equivalent to a few pickup truck loads of waste. Twelve (12) of these sites (9, 12, 13, 14, 19, 23, 27, 28, 41, 45, 61, and 62) also contained piles of dirt, concrete, or, to a lesser degree, green waste. Minor waste disposal sites were distributed throughout the study area, but were generally lacking north of St. Mary's Road and in unpopulated areas on San Xavier District lands.

Fourteen (14) sites (3, 4, 7, 10, 17, 20, 24, 29, 32, 36, 42, 43, 44, and 58) contained piles of dirt, concrete, or, to a lesser degree, green waste, but did not have any

additional wildcat dumping. In some cases, these sites might be considered storage sites rather than dumping sites.

Previously Documented Landfills

Nine (9) previously documented landfills, "El Dumpe," St. Mary's, Rio Nuevo North, Rio Nuevo South, "A" Mountain, Mission, 29th Street, Cottonwood, and Ryland were located within, or adjacent to, the study area. PAG staff visited each of these sites to document changes in land surface characteristics since PAG's site visits in 1993 for another project. However, it was beyond the scope of this project to further investigate landfill characteristics. More detailed landfill descriptions are available in PAG's 1993 and Dames & Moore's 1989 reports.

Several of the landfills (St. Mary's, Mission, 29th Street, and Cottonwood) had been graded and developed after landfill closure. Because of the on-site development, it was not possible to see any evidence for landfilling during the site visit for this project. Menlo Park, complete with baseball fields, basketball courts, and parking lots, was built over the St. Mary's Landfill. Mission Landfill had been graded and the Santa Cruz River Park had been constructed over the site. Pima County facilities had been built over most of the 29th Street Landfill. Single-family homes and mobile homes had been built on the surface of the Cottonwood Landfill.

Four (4) of the landfills (Rio Nuevo North, Rio Nuevo South, "A" Mountain, and Ryland) had significant amounts of wildcat dumping on site. Ryland Landfill was notable because the hummocky surface appeared to be a result of differential settling of landfill material. In addition, landfill material was exposed along the western edge of Ryland Landfill because the cover material had been eroded by high flows in the Santa Cruz River during episodic storm events.

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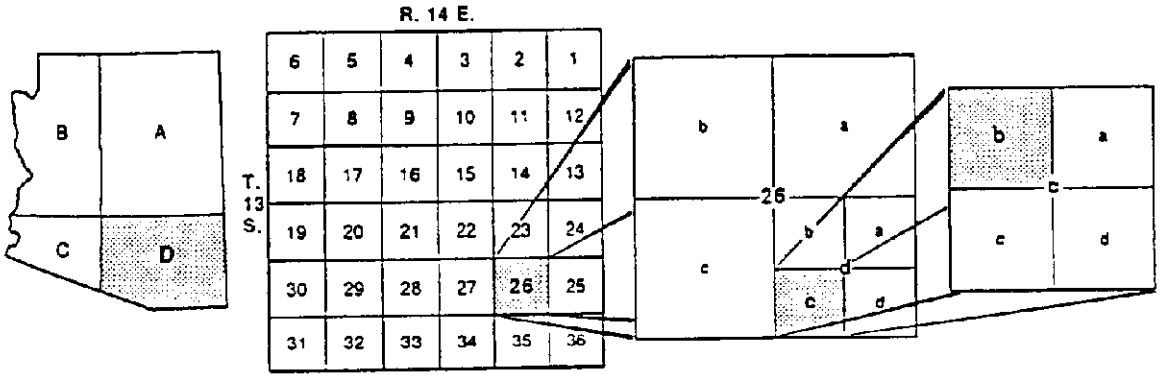
APPENDIX 1

NOTES FROM ANALYSES OF AERIAL PHOTOGRAPHS, SANTA CRUZ RIVER AREA BETWEEN GRANT ROAD AND PIMA MINE ROAD

This appendix contains notes made during the initial aerial photograph review. As part of this review, PAG identified and briefly described areas that appeared to be potential waste disposal locations. These sites included gravel pits, ponds, areas with significant off-road travel, and other unidentified disturbed areas. A general description of land use in the area was also included, if relevant.

The 1990 photo sets were reviewed as part of this project, with comparative analysis using corresponding 1974 and 1995 photo sets. The locations of areas that appeared disturbed on the photographs are provided in this Appendix. Each blue line photograph included four sections. The disturbed areas are described under the photograph on which they were identified, and under the section in which they were located. For each Township/Range, the photos are described from the north to south. Within each section, the sites are listed starting in the northeast and progressing counterclockwise to the southeast, using the Bureau of Land Management's system of land subdivision (see below). According to this system, the first letter in the site location denotes a particular 160-acre tract, the second the 40-acre tract, and the third the 10-acre tract. These letters are assigned in a counterclockwise direction from the northeast quadrant to the southeast quadrant as A, B, C, and D.



(adopted from Tadayon, 1995)

Time and budget constraints prevented PAG from visiting all of the sites noted on the aerial photographs. Sites that were excluded from the field visits included those that were out of the flood plain and those that had no nearby road access and were too far from a road to reach by foot. For completeness, however, all of the sites noted during the initial photo review are presented below.

1990 Photo 8-15
T14S, R13E
Sections 1, 2, 11, 12

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residential, commercial, and industrial development

Section 2

DCA: one site east of I-10 & west of railroad tracks -- creek bed with good access from highway & side street;

CDD: one site west of river -- vacant lot with good side street access;

B, C, D: one long large site on east bank with vacant & disturbed land, and dirt roads with some nubby texture;

1974 Photo 12-15:	DCA - undisturbed creek bed & vegetation;
(same area as above)	CDD - vacant;
	B,C,D - undisturbed, except for south end;
1995 Photo 69-28:	DCA - less disturbed than 1990;
(same area as above)	CDD - vacant;
	B, C, D - partially covered by river park;

Section 11

DAA, DAC, DDB: 3 sites east of I-10 -- vacant lots with sparse vegetation north of downtown (between Congress & St. Mary's);

AB, AC: two strip sites along Santa Cruz (North and south of St. Mary's) --disturbed and vacant;

DB: one large site (Rio Nuevo North landfill) -- west of river with great access;

CD: one site (now a park) that was St. Mary's Landfill -- west of Rio Nuevo North;

1974 Photo 12-15:	DAA, DAC - same as 1990;
(same area as above)	DDB - structures present;
	AB - structures present;
	AC - hummocky texture;
	DB - most disturbed and hummocky at this time;
	CD - same as 1990;

1995 Photo 69-28:
(same area as above)

DAA, DAC - same as 1990;
DDB - more disturbed than 1990;
AB, AC - covered by river park;
DB - same as 1990;
CD - structures present;

1990 Photo 7-15
T14S, R13E
Sections 3, 4, 9, 10

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residential, commercial, and industrial development

Section 3

AA, AD: two sites (vacant lots) on either side of river south of Grant -- good access;

1974 Photo 11-15:
(same area as above)

AA, AD - structures present that were destroyed before 1990;

No 1995 Photo Available

1990 Photo 8-14
T14S, R13E
Sections 13, 14, 23, 24

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residential, commercial, and industrial development

Section 14

AC, DB, DC: 3 sites on west bank between Broadway and Starr Pass Blvd. -- A-Mountain & Congress/Nearmont landfills and one disturbed lot (Starr Pass & Mission);

AC, DC, CD: 3 sites on east bank between Broadway and Starr Pass Blvd. (2 disturbed lot and one vacant lot);

1974 Photo 12-14:
(same area as above)

AC, DB, DC - landfilling more active than 1990;
AC - vacant land;
DC - slightly disturbed land, possible old dump;
CD - a few structures present, but otherwise dirt patch;

1995 Photo 69-27 :	AC, DB, DC - partially covered by river park;
(same area as above)	AC, DC - same as 1990;
	CD - covered by river park;

Section 23

BDA: one site on west bank at Y of Santa Cruz and West Branch -- old landfill;

AB, BA, BD: 3 sites on east bank between Starr Pass and Silverlake -- disturbed land and vacant lots;

CA: one site encompassing river south of Silverlake -- old landfill;

1974 Photo 12-14:	BDA - more disturbed than 1990, because more
(same area as above)	active and not built over;
	AB - vacant lot with dirt track;
	BA - disturbed land;
	BD - disturbed with more vegetation;
	CA - more disturbed-looking than 1990;
1995 Photo 69-27 :	BDA - built over more than 1990;
(same area as above)	AB - same as 1990;
	BA - still disturbed but river park built over part;
	BD - disturbed with river park over part;
	CA - less disturbed-looking than 1990;

1990 Photo 8-13
T14S, R13E
Sections 25, 26, 35, 36

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residential, commercial, and industrial development

Section 26

BC, BCBC, CBA, BD, CD: 5 sites west of river and between Ajo Way and 36th Street -- one is Cottonwood Landfill and one is well;

BD, ACCC, A, CD: 4 sites east of river -- one is Ryland Landfill and one is well;

1974 Photo 12-13:	BC, BCBC, CBA, BD, CD - same as 1990;
(same area as above)	BD, ACCC, A, CD - same as 1990;
1995 Photo 69-26:	BC, BCBC, CBA, BD, CD - same as 1990;
(same area as above)	BD, ACCC, A, CD - same as 1990;

Section 35

CAC, CBA, CCC: 3 wells on east side of river in vacant lot;

BBA: one site south of Ajo Way -- vacant lot near structures and east of river;

CC: Possible wildcat dump near influx of West Branch -- disturbed land;

B & C: one site west of river -- disturbed land -- sparse vegetation;

CD: one site north of Irvington, west of I-19 and east of river - old landfill according to Well Protection Document; Slightly suspicious-looking;

1974 Photo 12-13:	CAC, CBA, CCC - same as 1990;
(same area as above)	BBA - same as 1990;
	CC - not present;
	B & C - farmland;
	CD - same as 1990;
1995 Photo 69-26:	CAC, CBA, CCC - same as 1990;
(same area as above)	BBA - same as 1990;
	CC - same as 1990;
	B & C - more vegetation than 1990, otherwise same;
	CD - same as 1990;

1990 Photo 8-12
T15S, R13E
Sections 1, 2, 11, 12

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mainly new residential development

Section 2

BBA, BB, BD, CB: 5 sites along river and west of Calle Santa Cruz -- disturbed land with main and dirt road accesses -- sparse vegetation, linear areas parallel with river;

1974 Photo 12-12 :	BBA, BB, BD, CB - vacant, but not disturbed;
(same area as above)	
1995 Photo 69-25 :	BBA, BB, BD, CB - same as 1990;
(same area as above)	

Section 11

BB, B, CC, CCD: 4 sites along river on both sides west of I-19 and Calle Santa Cruz -- vacant lots, good access from river and N-S roads;

CAC: one small site east of Calle Santa Cruz -- separate access road; dirt patch amidst native vegetation;

CBA: two wells on east bank of river and west of Calle Santa Cruz -- good access, dirt roads small disturbed dirt patches surrounding each;

1974 Photo 12-12:	BB, B, CC, CCD - vacant land but not as
(same area as above)	disturbed as 1990;
	CAC - same as 1990;
	CBA - same as 1990;
1995 Photo 69-25:	BB, B, CC, CCD - same as 1990;
(same area as above)	CAC - same as 1990;
	CBA - same as 1990;

1990 Photo 7-12
T15S, R13E
Sections 3, 4, 9, 10

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agricultural, residential and vacant lots;

Section 3
mainly vacant lots and new development;

(2 sites on margin with Section 2 - described in that section);

Section 10

(1 site on margin with Section 11 - described in that section);

A: one site along west bank of river -- disturbed land;

DBB, DCC: two disturbed areas amidst farmland (outside boundary);

1974 Photo 11-12:	A - vacant lot with some disturbed vegetation;
(same area as above)	DBB, DCC - farmland;
1995 Photo 68-25:	A - same as 1990;
(same area as above)	DBB, DCC - same as 1990;

1990 Photo 8-11
T15S, R13E
Sections 13, 14, 23, 24

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agricultural, industrial, and residential;

Section 14

CAD, CDD: two sites east of I-19 near structures; dirt patches with good access -- vacant lots;

CCB, CCD: site on either side of river north of Los Reales Road with slight hummocky texture and vegetation;

B & C: Sand & gravel operation with pits and piles and ponds -- large site in bend of river;

B: Site north of above site that is a vacant lot -- large dirt patch;

BBB: Site across river from above site and south of Valencia -- possible pits and little vegetation;

1974 Photo 12-11:	CAD, CDD - dirt and farmland;
(same area as above)	CCB, CCD - same as 1990;
	B & C - operation smallest at this time;
	B - part of above sand & gravel operation;
	BBB - brush and old farmland;
1995 Photo 69-24:	CAD, CDD - same as 1990;
(same area as above)	CCB, CCD - same as 1990;
	B & C - operation largest at this time;
	B - same as 1990;
	BBB - same as 1990;

Section 23

DC, CDD, CC, DBB: 4 sites around Martinez Hill -- small with small dirt access roads -- one along riverbank looks partially washed away;

B: one large site east of I-19 that has hummocky texture;

BD: one site east of I-19 near a structure -- looks like someone tossed stuff down a hill;

B, CB: two sites west of I-19 in or near river -- all with good access from roads and river -- partly washed away;

BA: one site near good dirt road -- disturbed vegetation;

1974 Photo 12-11: *(same area as above)*	DC, CDD, CC, DBB - not present; B - farmland; BD - undisturbed land; B, CB - largest at this time, active sand & gravel operations; BA - undisturbed land and vegetation;
1995 Photo 69-24: *(same area as above)*	DC, CDD, CC, DBB - same as 1990, except one along river bank has been partially washed away; B - same as 1990; BD - same as 1990; B, CB - more washed away between 1990 & 1995; BA - same as 1990;

1990 Photo 7-11
T15S, R13E
Sections 15, 16, 21, 22

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agricultural, industrial, and residential;

Section 15

D: large site that's a landfill or sand & gravel operation;

A: one site south of industrial complex south of Valencia -- vacant, some vegetation, slightly disturbed;

ABB: one site near industrial -- large vacant lot;

BB: Huge vacant lot south of Valencia and west of industrial -- good access;

CD: Large vacant lot with dirt track - north of Los Reales Road -- good access from south and east;

AAB: small lot south of Valencia east of industrial -- vegetation, vacant lot, great access from north and west;

1974 Photo 11-11:	D - farmland;
(same area as above)	A - somewhat disturbed;
	ABB - farmland;
	BB - same as 1990;
	CD - farmland with track;
	AAB - same as 1990;
1995 Photo 68-24:	D - same as 1990;
(same area as above)	A - some of 1990 site converted to industrial;
	ABB - same as 1990;
	BB - some of 1990 site converted to commercial and/or industrial use;
	CD - same as 1990;
	AAB - same as 1990;

Section 22

DCC: one site north of San Xavier Road -- disturbed area between two structures;

DD: one large site north of San Xavier Road and next to west bank of river -- disturbed land with little vegetation;

ADA: one hummocky site west of river and east of farmland;

CDB: one site north of San Xavier Road -- hummocky site adjacent to farmland, good access;

DBCD, DBCB: two sites near structures and northeast of San Xavier Mission -- adjacent to farmland -- one is disturbed, the other one had old cars or something on it -- good access;

B: one site south of Los Reales Road surrounded on 3 sides by farmland -- vegetated, rectangular, no visible structures;

1974 Photo 11-11:	DCC - disturbed land present;
(same area as above)	DD - more vegetation than 1990;
	ADA - more land present (partly washed away before 1990);
	CDB - farmland;
	DBCD - farmland;
	DBCB - same as 1990;
	B - farmland;

1995 Photo 68-24: DCC - same as 1990;
(same area as above) DD - less land and vegetation than 1990 (partly washed away);
ADA - more of site washed away between 1990 & 1995;
CDB - same as 1990;
DBCD, DBCB - same as 1990;
B - same as 1990;

1990 Photo 8-10
T15S, R13E
Sections 25, 26, 35, 36

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mainly undisturbed desert;

Section 25

AAAA: site near Nogales Highway -- intersection of two dirt roads -- large dirt patch;

ADB: small site with separate access road -- dirt patch with no visible structure;

1974 Photo 12-10: AAAA - same as 1990;
(same area as above) ADB - not present;

1995 Photo 69-23: AAAA - same as 1990;
(same area as above) ADB - same as 1990;

Section 26
active & dormant agriculture and undisturbed land, except for dirt access roads;

AC, DABA: two sites on east side of river that are connected by access -- large disturbed area with mounds of dirt and little vegetation -- access to east and north and to river;

BD: site on west side of river in sandbar with streaky patterns perpendicular to riverflow -- access from west near farmland;

1974 Photo 12-10: AC, DABA - farmland;
(same area as above) BD - access present, but land not disturbed;

1995 Photo 69-23: AC, DABA - same as 1990;
(same area as above) BD - same as 1990;

Section 35
undisturbed land with dirt access roads and flood diversion berm running from I-19 to the Santa Cruz River;

BA: one site near access to west side of river -- old uncultivated farmland (dirt patch);

ABB: one site near access to west side of river -- disturbed land near edge of river where access ends;

A & D: site on west of river with several access roads (large area of irregular shape) -- fairly disturbed land with some vegetation;

1974 Photo 12-10:	BA - farmland;
(same area as above)	ABB - same as 1990;
	A & D - sandbar, no disturbance;
1995 Photo 69-23:	BA - same as 1990;
(same area as above)	ABB - same as 1990;
	A & D - disturbed land present;

Section 36
undisturbed desert with small dirt access roads; nothing "suspicious" on topographic map or aerial photos;

1990 Photo 7-10
T15S, R13E
Sections 27, 28, 33, 34

Section 27
active farmland; scattered structures and dirt roads amidst natural desert;

AD: one site along I-19 near river -- disturbed land;

CAC: one site close to Little Nogales Dr. southwest of farmland -- mounds of dirt;

CD: one site close to Little Nogales Dr. southwest of farmland -- a drainage channel;

CCC: one site close to Little Nogales Dr. southwest of farmland -- an intersection with vacant lots;

1974 Photo 11-10:
(same area as above)

AD - same as 1990;
CAC - farmland;
CD - drainage not disturbed;
CCC - intersection not in same form at this point;

1995 Photo 68-23:
(same area as above)

AD - same as 1990;
CAC - same as 1990;
CD - same as 1990;
CCC - lots around intersection most disturbed at this point;

Section 34
mainly undisturbed desert with dirt roads;

BDD: water tank surrounded by disturbed land;

DA, DD: two sites along west side of I-19 -- one small with wall around it and other to the south a large disturbed area;

AB: one site south of farmland -- disturbed area;

1974 Photo 11-10:
(same area as above)

BDD - land around water tank most disturbed at this time;
DA, DD - not present;
AB - disturbed land located at south end of 1990 site;

1995 Photo 68-23:
(same area as above)

BDD - land around water tank less disturbed than 1990;
DA, DD - same as 1990;
AB - area of disturbance larger than 1990;

1990 Photo 8-9
T16S, R13E
Sections 1, 2, 11, 12

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undisturbed desert;

Section 2

B: site near I-19 -- disturbed land with roads -- most established in 1974;

Found Gravel pit west of I-19 on topographic maps and aerials -- present since 1974 when it was most established (in Section 3, but located on fringe of this photo);

1974 Photo 12-9: B - disturbed land most established (heavily
(same area as above) traveled) at this time;

1995 Photo 69-22: B - land not as disturbed as 1990;
(same area as above)

Section 11

C: Borrow Pit north of one in Section 14 -- large, rectangular lot with access roads coming from west (near I-19) -- disturbed land with little vegetation;

1974 Photo 12-9: C - borrow pit largest and most heavily used at
(same area as above) this time (roads most pronounced);

1995 Photo 69-22: C - borrow pit present, but not heavily used;
(same area as above)

1990 Photo 8-8
T16S, R13E
Sections 13, 14, 23, 24

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mostly undisturbed desert;

Section 13

CA: cut-in area near river and road to Borrow Pit -- present in 1974 and 1995 also;

BBB: water tank with clearing and creek/road access -- disturbed land 1974-1995;

1974 Photo 12-8: CA - cut-in area present;
(same area as above) BBB - land disturbed around water tank;

1995 Photo 69-21: CA - cut-in area present, although harder to see;
(same area as above) BBB - land still disturbed;

Section 14

C: Borrow pit on topographic map -- large rectangular lot with roads leading east and west;

1974 Photo 12-8: C - borrow pit present;
(same area as above)

1995 Photo 69-21: C - borrow pit present;
(same area as above)

Section 24
roads are virtually nonexistent (main one is along eastern district boundary);

D: disturbed land along north-south main road;

1974 Photo 12-8: D - land not disturbed in 1974;
(same area as above)

1995 Photo 69-21: D - disturbance not as obvious as 1990, but still present;
(same area as above)

1990 Photo 8-7
T16S, R13E
Sections 25, 26, 35, 36

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mainly undisturbed desert;

Section 25

roads are sparse;

DA: one site SSW of diagonal road between river and reservation boundary -- dirt patch;

AD, DAD: two intersections on E1/2 may have some dumping (near boundary road - one with creek and one with dirt road);

1974 Photo 12-7: DA - vacant lot with some vegetation;
(same area as above) AD, DAD - same as 1990;

1995 Photo 69-20: DA - vacant lot with no vegetation;
(same area as above) AD, DAD - same as 1990.

APPENDIX E

Test Pit And Test Boring Logs

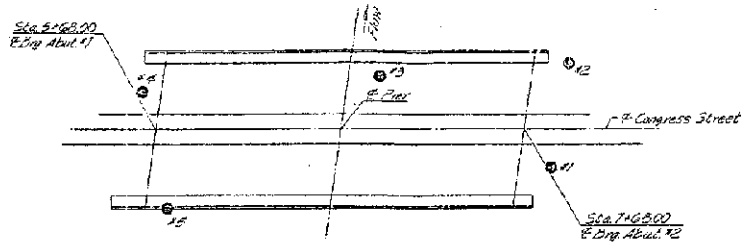
PASEO DE LAS IGLESAS - SANTA CRUZ RIVER
TUCSON, ARIZONA
PIMA COUNTY WO#: 4FPDLI

BORING LOGS FOR THE BACKHOE TEST PITS

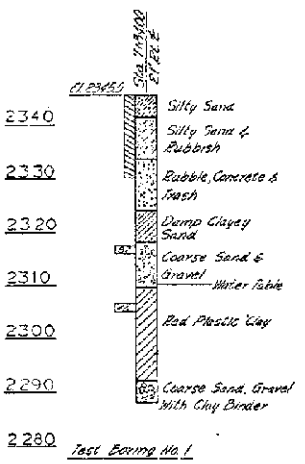
(Reference the aerial photo site plan for the test pit locations)

TEST BORING	SAMPLE DEPTH	SOIL CLASSIFICATION
1C	0 - 4 ft.	Silty Sand (SM) brown
2C	0 - 2 ft.	Silty Gravel (GM) brown
2E	0 - 2 ft.	Sandy Silt (ML) light brown
3C	0 - 5 ft.	Silty Sand (SM) brown
4C	0 - 2 ft.	Silty Sand (SM) brown
4E	0 - 2 ft.	Sandy Silt (ML) light brown
4W	0 - 8 ft.	Sandy Silt (ML) light brown
5C	0 - 2 ft.	Silty Sand (SM) brown
5E	0 - 2 ft.	fine Silty Sand (SM) light brown
5W	0 - 2 ft.	Sandy Silt (ML) light brown to tan
6C	0 - 2 ft.	Silty Gravel (GM) brown
6E	0 - 10 ft.	Sandy Silt (ML) light brown
7C	0 - 3 ft.	Silty Sand (SM-SP) brown
7E	0 - 10 ft.	Gravel with Sand, Silt and Clay (GM) brown
7W	0 - 5 ft.	Sandy Silt (ML) light brown
8C	0 - 4 ft.	Sandy Silt (ML) light brown to tan
8W	0 - 8 ft.	Sandy Silt (ML) light brown to tan
9C	0 - 3 ft.	Silty Sand (SM) light brown
10C	0 - 4 ft.	Silty Sand (SM) light brown
11C	0 - 2 ft.	Silty Sand (SM) light brown

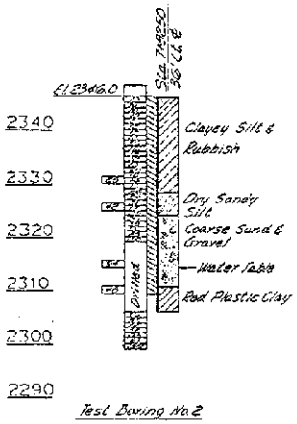
CONGRESS STREET - TUCSON
SANTA CRUZ RIVER BRIDGE
PIMA COUNTY



PLAN
SCALE 1" = 30'



Test Boring No. 1



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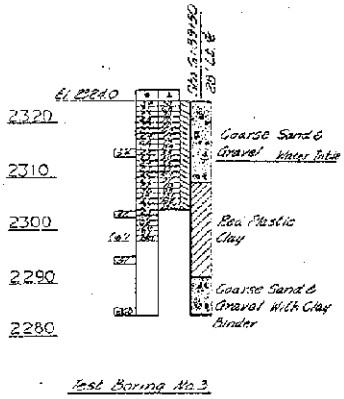
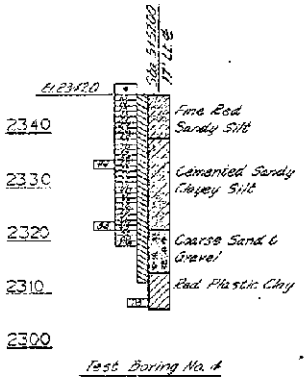


Test Boring No. 3



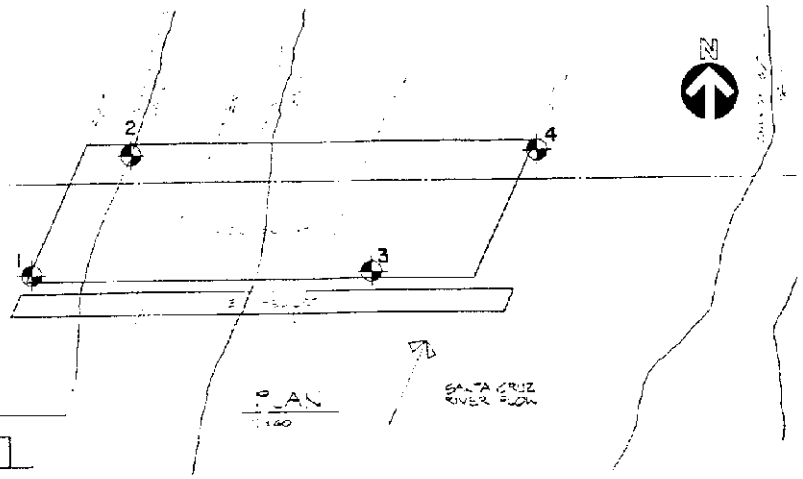
Test Boring No. 4

LEGEND OF BORING OPERATIONS

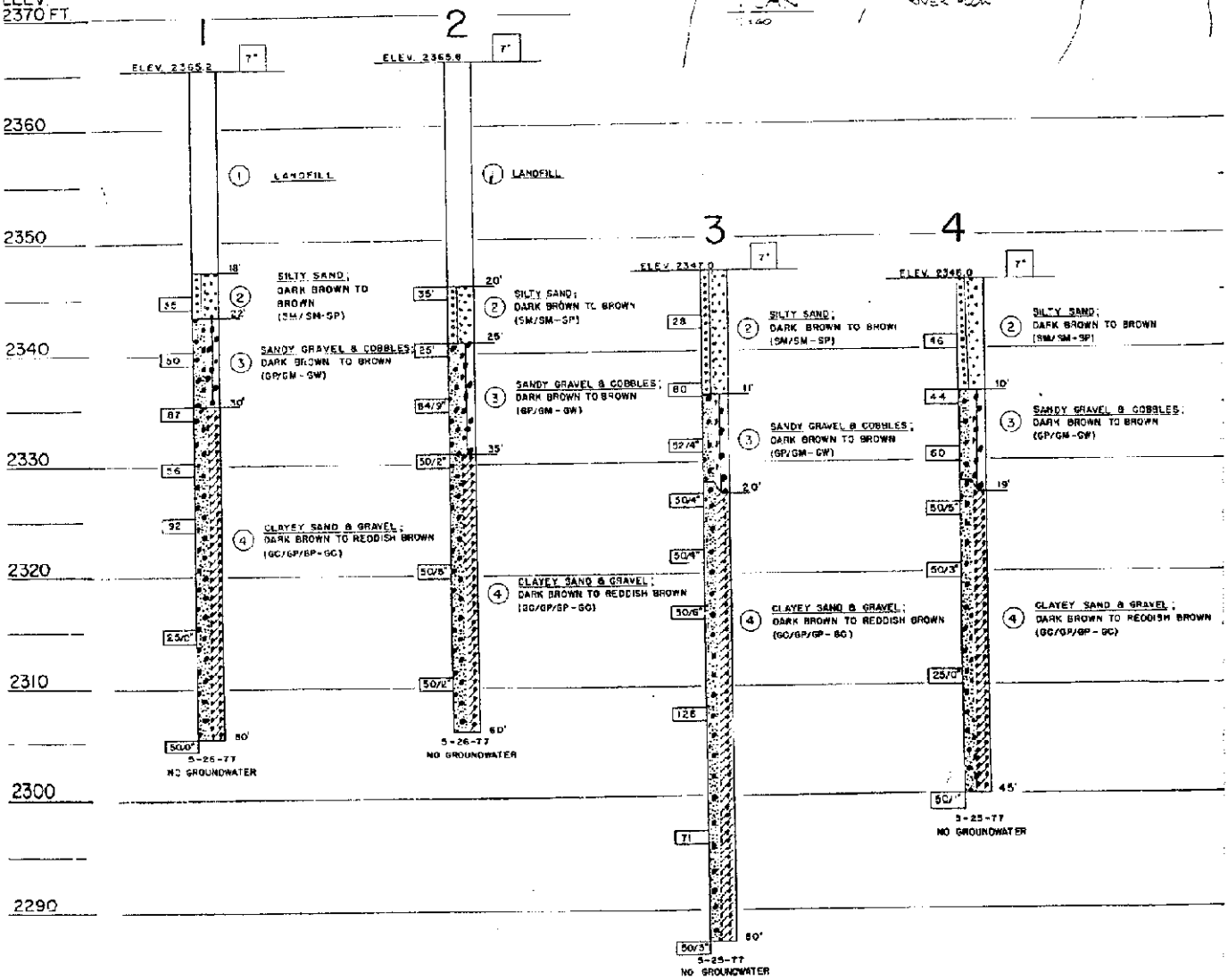
- BLOW COUNT 2½" I.D. SPLIT SPOON SAMPLER
- 5" I.D. STEEL PIPE SLEEVE
- BLOW COUNT 2" BULLNOSE PENETROMETER
- * BLOW COUNT ON DRIVEN PIPE SLEEVE

* WHERE PIPE SLEEVE IS SHOWN WITH NO BLOW COUNT, IT WAS DRIVEN BEHIND AUGER HEAD

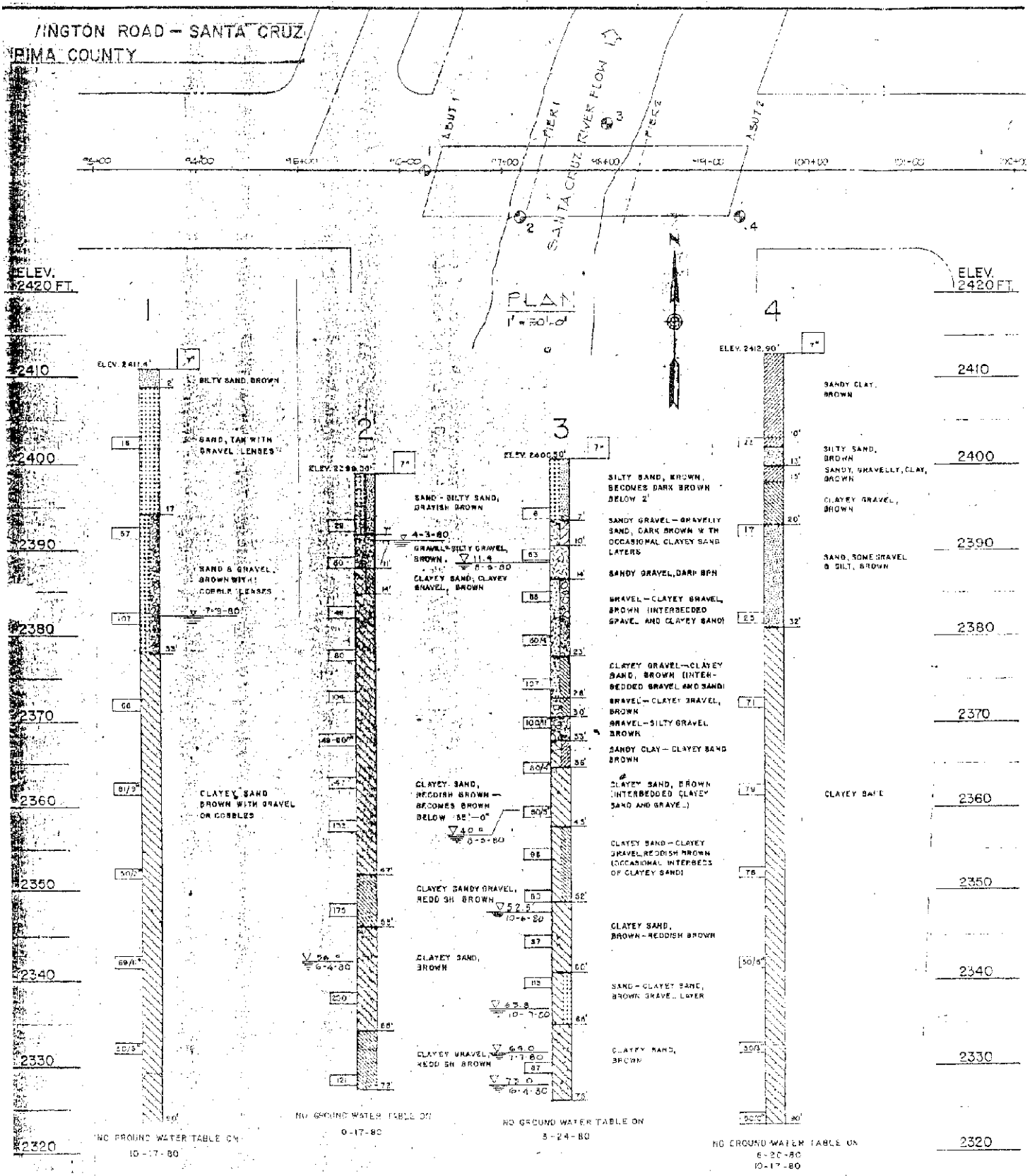
22nd STREET
I-10 TO MISSION RD.
CITY OF TUCSON

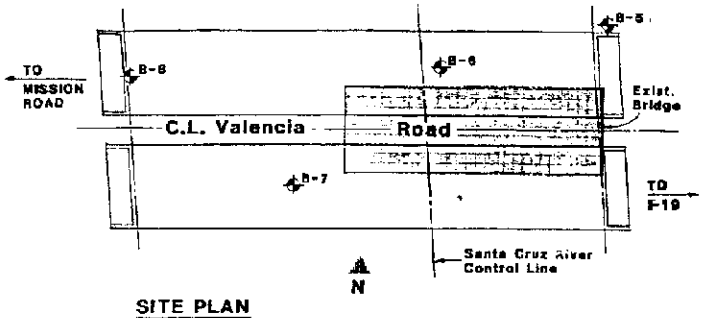


THE BORING LOGS SHOW SUBSURFACE CONDITIONS EXISTANT AT THE DATES AND LOCATIONS INDICATED, AND IT IS NOT WARRANTED THAT THEY ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES

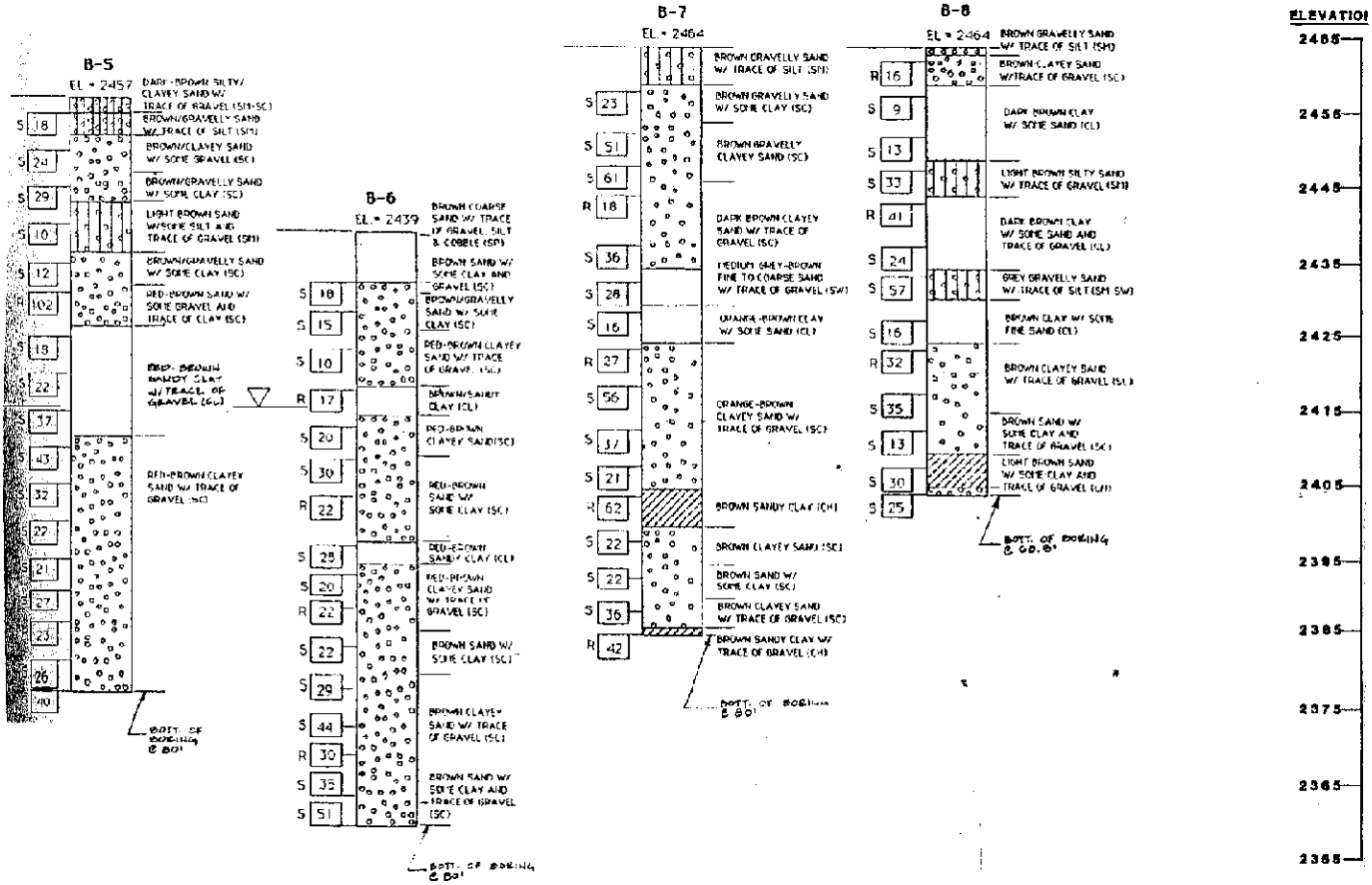


/INGTON ROAD – SANTA CRUZ
PIMA COUNTY





SITE PLAN
1" : 50'-0"



MAP 1

Site Plan

MAP 2

Depth to Groundwater (Tucson Water)