

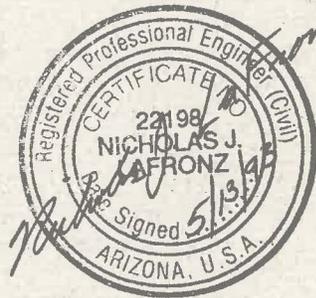
2/28/17 DICK PERREAULT
DON RERICK

Property of
Flood Control District of MC Library
Return to
2801 W. Durango
Phoenix, AZ 85009

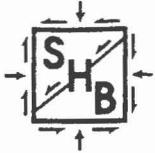
INTERIM REPORT

**East Papago - Holbrook - Bay Harbor Freeways
Investigation of the Conceptual
Alignment for 100-Year 215,000
cfs South Bank Protection from
McClintock Drive 3,600 feet East
Maricopa County, Arizona**

SHB Job No. E27-56
Letter No. 1119



SHB AGRA, INC.
Engineering & Environmental Services



SHB AGRA, INC.
Engineering & Environmental Services

3232 West Virginia Avenue
Phoenix, Arizona 85009
Phone: 602-272-6848
Fax: 602-272-7239

March 18, 1994

Arizona Department of Transportation
205 North 17th Avenue
Room 216E
Phoenix, Arizona 85007

SHB Job No. E87-56
Letter No. 1189

Attention: Mr. Terry Bourland

Re: East Papago - Hohokam -
Sky Harbor Freeways
ADOT Project No. 202L MA H 0855 01D
Arizona Department of Transportation
Maricopa County, Arizona

RECEIVED

MAR 18 1994

STATEWIDE PROJECT
MANAGEMENT

Subject: Summary of man-made fill removal.

Gentlemen:

At the request of Mr. Terry Bourland of the Arizona Department of Transportation (ADOT) we have compiled the following summary of information related to the investigation, design and removal of man-made fills along the Salt River near the Old Tempe Landfill (OTL). Presented are details of the findings of the investigative phase of the project, along with estimates of in-place quantities of man-made material and related costs for removal. Also presented are actual findings and construction cost for the removal phase of the referenced project.

1. INVESTIGATION

No hazardous materials, were encountered in the project area. "Hazardous materials" as used herein is defined as hazardous, toxic infectious, or radioactive substances, materials or wastes in the Comprehensive Environmental Response Compensation and Liability Act of 1980 ("CERCLA") as amended by the Superfund Amendments and



East Papago - Hohokam -
Sky Harbor Freeways
ADOT Project No. 202L MA H 0855 01D
Arizona Department of Transportation
Maricopa County, Arizona
SHB Job No. E87-56
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Reauthorization Act of 1986 (PL 99-499); the Hazardous Materials Transportation Act, 49 U.S.C. Section 1801, et seq.; the Toxic Substance Control Act, 15 U.S.C. Section 2601 et seq.; the Resource Conservation and Recovery Act, as amended, 42 U.S.C. Section 6901, et seq.; the Arizona Environmental Quality Act, Title 49, Arizona Revised Statutes; and in the rules or regulations adopted and guidelines promulgated pursuant to these laws were encountered in the project area.

Investigations, however, identified several classes of nonhazardous materials, including but not limited to construction debris and rubbish, municipal solid waste (MSW), asbestos-containing materials, soils contaminated with petroleum hydrocarbons, a variety of volatile organic compounds and metals (typically below action levels).

2. QUANTITY & COST ESTIMATES

Total excavation quantities for the area adjacent to the OTL were estimated to consist of approximately 431,000 cubic yards (CY) of sand, gravel and cobble fill material; 21,500 tons of MSW; and 4,500 tons of rubbish. It was estimated that of the total excavation quantity, roughly 6,000 CY would be contaminated with petroleum hydrocarbons and require handling as a special waste by an ADOT hazardous contractor, outside the scope of the removal contract.

The estimated excavation cost for the removal of man-made fills in the area of the OTL was \$1.90 million. The cost of hauling and disposal of rubbish and MSW was estimated to total \$527,000.00. The total project



East Papago - Hohokam -
Sky Harbor Freeways
ADOT Project No. 202L MA H 0855 01D
Arizona Department of Transportation
Maricopa County, Arizona
SHB Job No. E87-56
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cost, excluding handling of hazardous or special wastes, was projected to be \$2.46 million.

A contingency amount was set aside for costs related to handling of special wastes and possible discovery of hazardous wastes.

3. ACTUAL PROJECT QUANTITIES & COSTS

Actual excavation quantities of sand, gravel and cobble fill totaled approximately 450,000 CY. Quantities of rubbish and MSW removed from the project were 32,250 and 4,000 tons, respectively. A total of 5,000 CY of petroleum-contaminated soils were removed from the project. Additional work required during construction involved mitigation of a clay layer in an aggregate wash-out pit through the installation of a wick drain system.

The overall accumulated cost of the removal of man-made fills, excluding the handling of special wastes, was 10% over the contract bid amount. Accumulated costs totaled \$2.3 million, including the 10% escalation, which was \$160,000.00 under the estimated project cost.



East Papago - Hohokam -
 Sky Harbor Freeways
 ADOT Project No. 202L MA H 0855 01D
 Arizona Department of Transportation
 Maricopa County, Arizona
 SHB Job No. E87-56
 Letter No. 1189

Should you have any questions concerning the information presented in this summary, please do not hesitate to call the undersigned.

Respectfully submitted,
 SHB AGRA, Inc.

By Charles E. Reynolds 
 Charles E. Reynolds
 Staff Geologist

Reviewed by Nicholas J. Lafronz
 Nicholas J. Lafronz



Copies: Addressee (1)
 1d/M-1/3-18-94

FACSIMILE
COVER SHEET

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
300 WEST CLARENDON, SUITE 400
PHOENIX, ARIZONA 85013-3499
PHONE: (602) 277-1074
FAX: (602) 241-0721

PLEASE CALL IF PROBLEMS OCCUR OR RECIPIENT'S
CONFIRMATION IS REQUIRED.

DATE OF
TRANSMITTAL: 3/25/94

CHARGE NUMBER: _____

RECIPIENT'S FAX NUMBER: 506-4601

ATTENTION: Richard Perreault 3/28/94

FROM: Judy Lyles

WE ARE SENDING 2 PAGE(S).

MESSAGE:

*This table is information you requested
from Terry Bourland (ADOT-SPM). If
you have any questions or require
additional information, please call me
at 277-1074.*

Thanks,

Judy

BID TABULATIONS
202L MA 8 H 2151 04C RAM-600-5-507
EAST PAPAGO (Indian Bend Wash - Jct. 101L)

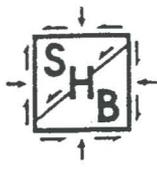
ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED AMOUNT
2020001	Rem. of Structures & Obstructions	L.Sum	1	\$40,000.00	\$40,000.00
	ADOT			\$225,000.00	\$225,000.00
	SUNDT				
2030201	Excavation (SRP-75, -78)	Cu.Yd.	128,600	\$20.00	\$2,572,000.00
	ADOT			\$16.40	\$2,109,040.00
	SUNDT				
2030202	Excavation (OTL)	Cu.Yd.	430,800	\$4.00	\$1,723,200.00
	ADOT			\$2.50	\$1,077,000.00
	SUNDT				
2070001	Dust Palliative	M.Gal.	9,400	\$8.00	\$75,200.00
	ADOT			\$8.00	\$75,200.00
	SUNDT				
2080001	Separation Geotextile Fabric	Sq.Yd.	50,000	\$1.50	\$75,000.00
	ADOT			\$2.25	\$112,500.00
	SUNDT				
5011075	Pipe, Rein. Conc. Class V, 72"	L.Ft.	264	\$300.00	\$79,200.00
	ADOT			\$250.00	\$66,000.00
	SUNDT				
7010001	Maint. & Protection of Traffic	L.Sum.	1	\$50,000.00	\$50,000.00
	ADOT			\$50,000.00	\$50,000.00
	SUNDT				
7010006	Furn. & Install Temp Traff. Cont. Dev.	L.Sum	1	\$10,000.00	\$10,000.00
	ADOT			\$20,000.00	\$20,000.00
	SUNDT				
9010001	Mobilization	L.Sum	1	\$500,000.00	\$500,000.00
	ADOT			\$400,000.00	\$400,000.00
	SUNDT				
9240010	Force Acct. (Break up Concrete)	L.Sum	1	\$10,000.00	\$10,000.00
	ADOT			\$10,000.00	\$10,000.00
	SUNDT				
9240011	Force Acct. (Isolation Areas)	L.Sum	1	\$45,000.00	\$45,000.00
	ADOT			\$45,000.00	\$45,000.00
	SUNDT				
9240121	Misc. Work (Decontamination Sites)	Ea.	3	\$15,000.00	\$45,000.00
	ADOT			\$25,000.00	\$75,000.00
	SUNDT				
9240140	Misc. Work (Off Site Hauls, MSW, OTL)	Ton	21,500	\$22.00	\$473,000.00
	ADOT			\$20.00	\$430,000.00
	SUNDT				
9240141	Misc. Work (Off Site Hauls, RBH, OTL)	Ton	4,400	\$12.25	\$53,900.00
	ADOT			\$17.00	\$74,800.00
	SUNDT				
9240170	Contractor Quality Control	L.Sum	1	\$40,000.00	\$40,000.00
	ADOT			\$35,000.00	\$35,000.00
	SUNDT				
9250001	Construction Surveying & Layout	L.Sum	1	\$50,000.00	\$50,000.00
	ADOT			\$30,000.00	\$30,000.00
	SUNDT				
9260004	Engineers Field Office	L.Sum	1	\$15,000.00	\$15,000.00
	ADOT			\$27,000.00	\$27,000.00
	SUNDT				

SMB
EST.
—
\$5.00

\$29.00
\$25.00

ADOT \$5,856,500.00
SUNDT \$4,861,540.00

RGP



SHB AGRA, INC.
Engineering & Environmental Services

3232 West Virginia Avenue
Phoenix, Arizona 85009
Phone: 602-272-6848
Fax: 602-272-7239

July 23, 1993

DMJM
300 West Clarendon Avenue
Suite 335
Phoenix, Arizona 85013-3499

SHB Job No. E87-56
Letter No. 1119
Revision No. 1

Attention: Thomas M. Monchak, P.E.

Re: East Papago - Hohokam -
Sky Harbor Freeways
Investigation of the Conceptual
Alignment for 100-Year 215,000
cfs South Bank Protection From
McClintock Drive 3,600 Feet East
Maricopa County, Arizona

FLOOD CONTROL DISTRICT RECEIVED	
JUL 23 1993	
CHENG	P&PM
	HYDRO
	ENGT
	FILE
REMARKS	
7/26 MB	

Gentlemen:

At the request of Mr. Terry Bourland of the Arizona Department of Transportation (ADOT), the cost estimates presented in Appendix D of the referenced report have been revised. The revised estimates more accurately reflect the funding required to remove the man-made fills and construct the south hardbank along the proposed 100-year 215,000 cfs alignment.

The estimated cost shown for construction of a temporary soil nail wall was not included in the original construction subtotal for Alternative 3. The estimated cost for Alternative 3 also has been revised to include the cost of the temporary soil nail wall.

The attached revision to Appendix D should be incorporated as part of the original report. Additionally, estimated cost totals for the three man-made fill removal alternatives on pages 24 and 26 of SHB Letter No. 1119 should be revised to reflect the totals given in the attached Appendix D revisions.



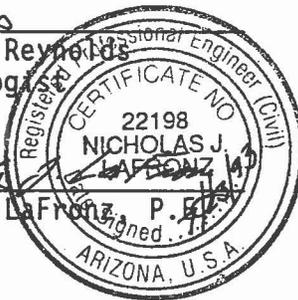
East Papago - Hohokam -
 Sky Harbor Freeways
 Investigation of the Conceptual
 Alignment for 100-Year 215,000
 cfs South Bank Protection From
 McClintock Drive 3,600 Feet East
 Maricopa County, Arizona
 SHB Job No. E87-56
 Letter No. 1119
 Revision No. 1

Should you have any questions regarding the revisions, please call the undersigned.

Respectfully submitted,
 SHB AGRA, Inc.

By Charles E. Reynolds
 Charles E. Reynolds
 Staff Geologist

Reviewed by Nicholas J. LaFrantz
 Nicholas J. LaFrantz, P.E.



Copies: Addressee (3)
 Arizona Department of Transportation
 Attn: Steven A. Jimenez, P.E. (4)
 City of Tempe
 Attn: Howard Hargis, P.E. (1)
 \ Maricopa County Flood Control District
 Attn: Mr. Don Rerick (1)

nj1/J2-93/7-23-93

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 1
 INVESTIGATION OF THE CONCEPTUAL
 ALIGNMENT FOR 100-YEAR 215,000 CFS
 SOUTH BANK PROTECTION McCLINTOCK
 DRIVE 3600 FEET EAST
 SHB JOB NO. E87-56
 LETTER NO. 1119
 REVISION NO. 1

ITEM	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
EXCAVATION				
MAN-MADE FILL	CY	509,000	\$ 5.00 *	2,545,000.00
NATIVE MATERIAL	CY	40,000	2.00 *	80,000.00
TRANSPORTATION & DISPOSAL				
MSW (1.15 TONS/CY)	TON	88,000	29.00 *	2,552,000.00
RUBBISH (1.15 TONS/CY)	TON	88,000	25.00 *	2,200,000.00
PLACEMENT OF REUSABLE MATERIAL	CY	356,000 @	0.50	178,000.00
COMPACTED CLAY CAP	SY	14,700	10.00	147,000.00
CEMENT STABILIZED ALLUVIUM				
AVG. HEIGHT x 8' THICK x 3600 FEET	CY	50,000 ‡	25.00 ‡	<u>1,250,000.00</u>
SUBTOTAL				\$ 8,952,000.00
MOBILIZATION *				<u>716,160.00</u>
SUBTOTAL				\$ 9,668,160.00
CONSTRUCTION ADMINISTRATION (15%)				<u>1,450,200.00</u>
SUBTOTAL				\$ 11,118,360.00
INCIDENTIAL TO CONSTRUCTION (15%)				<u>1,667,800.00</u>
TOTAL CONSTRUCTION				\$ 12,786,160.00

NOTE: * ESTIMATED COST BASED ON AVERAGE OF BIDS FOR ADOT PROJECT RAM 600-5-507.
 @ COST ESTIMATE DOES NOT INCLUDE THE PLACEMENT OF FILL MATERIAL BEHIND THE BANK PROTECTION LEVEE.
 ‡ QUANTITY AND COST ESTIMATE FOR CSA PROVIDED BY DMJM.

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 1
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119
REVISION NO. 1

PRELIMINARY ESTIMATE SUMMARY

RIGHT-OF-WAY AQUISITION	300,000.00
DESIGN	
CONSTRUCTION DOCUMENTS FILL REMOVAL AND HARDBANK CONSTRUCTION	125,000.00
HYDRAULIC DESIGN AND ANALYSIS	65,000.00
GEOTECHNICAL AND ENVIRONMENTAL RELATED DESIGN	60,000.00
CONSTRUCTION (see above detail)	<u>12,786,160.00</u>
GRAND TOTAL	** \$ 13,336,160.00

NOTE: ** REVISED TOTAL REPRESENTS THE TOTAL FUNDING THAT REMAINS TO
TO BE APPROPRIATED TO COMPLETE DESIGN AND CONSTRUCTION OF THE
REFERENCED BANK PROTECTION SYSTEM. THE REVISED TOTAL DOES NOT
INCLUDE \$250,000 PREVIOUSLY ALLOCATED BY THE CITY OF TEMPE FOR
THE ENVIRONMENTAL INVESTIGATION IN PROGRESS.

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 2
 INVESTIGATION OF THE CONCEPTUAL
 ALIGNMENT FOR 100-YEAR 215,000 CFS
 SOUTH BANK PROTECTION McCLINTOCK
 DRIVE 3600 FEET EAST
 SHB JOB NO. E87-56
 LETTER NO. 1119
 REVISION NO. 1

ITEM	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
EXCAVATION				
MAN-MADE FILL	CY	325,000	\$ 5.00 *	\$ 1,625,000.00
NATIVE MATERIAL	CY	40,000	2.00 *	80,000.00
TRANSPORTATION & DISPOSAL				
MSW (1.15 TONS/CY)	TON	56,000	29.00 *	1,624,000.00
RUBBISH (1.15 TONS/CY)	TON	56,000	25.00 *	1,400,000.00
PLACEMENT OF REUSABLE MATERIAL	CY	228,000 @	0.50	114,000.00
COMPACTED CLAY CAP	SY	15,400	10.00	154,000.00
CEMENT STABILIZED ALLUVIUM				
AVG. HEIGHT				
x 8' THICK				
x 3600 FEET	CY	50,000 #	25.00 #	<u>1,250,000.00</u>
SUBTOTAL				\$ 6,247,000.00
MOBILIZATION *				<u>499,760.00</u>
SUBTOTAL				\$ 6,746,760.00
CONSTRUCTION ADMINISTRATION (15%)				<u>1,012,000.00</u>
SUBTOTAL				\$ 7,758,760.00
INCIDENTIAL TO CONSTRUCTION (15%)				<u>1,163,800.00</u>
TOTAL CONSTRUCTION				\$ 8,922,560.00

NOTE: * ESTIMATED COST BASED ON AVERAGE OF BIDS FOR ADOT PROJECT RAM 600-5-507.
 @ COST ESTIMATE DOES NOT INCLUDE THE PLACEMENT OF FILL MATERIAL BEHIND THE BANK PROTECTION LEVEE.
 # QUANTITY AND COST ESTIMATE FOR CSA PROVIDED BY DMJM.

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 2
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119
REVISION NO. 1

PRELIMINARY ESTIMATE SUMMARY

RIGHT-OF-WAY AQUISITION	300,000.00
DESIGN	
CONSTRUCTION DOCUMENTS FOR FILL REMOVAL AND HARBANK CONSTRUCTION	125,000.00
HYDRAULIC DESIGN AND ANALYSIS	65,000.00
GEOTECHNICAL AND ENVIRONMENTAL RELATED DESIGN	60,000.00
CONSTRUCTION (see above detail)	<u>8,922,560.00</u>
GRAND TOTAL	** \$ 9,472,560.00

NOTE: ** THE REVISED TOTAL REPRESENTS THE TOTAL FUNDING THAT REMAINS TO BE APPROPRIATED TO COMPLETE DESIGN AND CONSTRUCTION OF THE REFERENCED BANK PROTECTION SYSTEM. THE REVISED TOTAL DOES NOT INCLUDE \$250,000 PREVIOUSLY ALLOCATED BY THE CITY OF TEMPE FOR THE ENVIRONMENTAL INVESTIGATION CURRENTLY IN PROGRESS.

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 3
 INVESTIGATION OF THE CONCEPTUAL
 ALIGNMENT FOR 100-YEAR 215,000 CFS
 SOUTH BANK PROTECTION McCLINTOCK
 DRIVE 3600 FEET EAST
 SHB JOB NO. E87-56
 LETTER NO. 1119
 REVISION NO. 1

ITEM	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
EXCAVATION				
MAN-MADE FILL	CY	302,000	\$ 5.00 *	\$ 1,510,000.00
NATIVE MATERIAL	CY	40,000	2.00 *	80,000.00
TRANSPORTATION & DISPOSAL				
MSW (1.15 TONS/CY)	TON	52,000	29.00 *	1,508,000.00
RUBBISH (1.15 TONS/CY)	TON	52,000	25.00 *	1,300,000.00
PLACEMENT OF REUSABLE MATERIAL	CY	211,000 @	0.50	105,500.00
COMPACTED CLAY CAP	SY	4,300	10.00	43,000.00
CEMENT STABILIZED ALLUVIUM				
AVG. HEIGHT x 8' THICK x 3600 FEET	CY	50,000 ‡	25.00 ‡	1,250,000.00
TEMPORARY SOIL NAIL WALL	SF	41,500	30.00	<u>1,245,000.00</u>
SUBTOTAL				\$ 7,041,500.00
MOBILIZATION *				<u>563,320.00</u>
SUBTOTAL				\$ 7,604,820.00
CONSTRUCTION ADMINISTRATION (15%)				<u>1,140,700.00</u>
SUBTOTAL				\$ 8,745,520.00
INCIDENTIAL TO CONSTRUCTION (15%)				<u>1,311,800.00</u>
TOTAL CONSTRUCTION				\$ 10,057,320.00

NOTE: * ESTIMATED COST BASED ON AVERAGE OF BIDS FOR ADOT PROJECT RAM 600-5-507.
 @ COST ESTIMATE DOES NOT INCLUDE THE PLACEMENT OF FILL MATERIAL BEHIND THE BANK PROTECTION LEVEE.
 ‡ QUANTITY AND COST ESTIMATE FOR CSA PROVIDED BY DMJM.

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 3

INVESTIGATION OF THE CONCEPTUAL

ALIGNMENT FOR 100-YEAR 215,000 CFS

SOUTH BANK PROTECTION McCLINTOCK

DRIVE 3600 FEET EAST

SHB JOB NO. E87-56

LETTER NO. 1119

REVISION NO. 1

PRELIMINARY ESTIMATE SUMMARY

RIGHT-OF-WAY AQUISITION	\$	300,000.00
DESIGN		
CONSTRUCTION DOCUMENTS FOR FILL REMOVAL AND HARDBANK CONSTRUCTION		125,000.00
HYDRAULIC DESIGN AND ANALYSIS		65,000.00
GEOTECHNICAL AND ENVIRONMENTAL RELATED DESIGN		60,000.00
CONSTRUCTION (see above detail)		<u>10,057,320.00</u>
GRAND TOTAL	** \$	10,607,320.00

NOTE: ** REVISED TOTAL REPRESENTS THE TOTAL FUNDING THAT REMAINS TO BE APROPRIATED TO COMPLETE DESIGN AND CONSTRUCTION OF THE REFERENCED BANK PROTECTION SYSTEM. THE REVISED TOTAL DOES NOT INCLUDE \$250,000 PREVIOUSLY ALLOCATED BY THE CITY OF TEMPE FOR THE ENVIRONMENTAL INVESTIGATION IN PROGRESS.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

INTEROFFICE MEMORANDUM

DATE: June 7, 1993

SUBJECT: Salt River Channel East of McClintock Drive
Soils Report for the Landfill and recommended solution.

TO: Dick Perreault *6/14/93*

CC: Don Rerick

CC: Warren Rosebraugh

VIA: Ed Raleigh *ER*

FROM: Raj Shah *RS*

I have reviewed the above referenced subject. I have also asked an opinion from Mr. Warren Rosebraugh for the above project. We think that all the alternatives presented are technically acceptable, but our recommended alternative would be the alternative #3.

Least cost (estimated) and least landfill excavation.

ER

FLOOD CONTROL DISTRICT

MEMORANDUM

May 21, 1993

SUBJECT: Salt River Channel East of McClintock Drive -
Design concepts for the 4,000' +/- South Levee

TO: EAR

CC: RGP

FROM: DJR

The attached SH&B Report represents the results of the "superfund" landfill site area testing in the vicinity of the proposed south channel levee east of McClintock Drive.

The report also makes recommendations for the design and the construction of the levee.

The District will be cost sharing in the design and the construction of this levee. Once ADOT has expended their funding cap of \$2,500,000 the District will expend up to our cost share limit of \$11,000,000.

In the next few weeks a follow up meeting will be held with ADOT, DMJM, SLA, SH&B and the District to discuss these report recommendations.

Please review this report and provide comments, suggestions, and any recommendations you may have on the report recommendations for the south levee. Any new or other ideas you may have would also be appreciated. Provide your comments to RGP (with a copy to me) by June 11, 1993.

The follow up meeting will be held in early June. Dick Perreault will let you know when it is scheduled. (I will be on vacation!)

Thanks.



ARIZONA DEPARTMENT OF TRANSPORTATION



HIGHWAY DIVISION

206 South Seventeenth Avenue - Phoenix, Arizona 85007-3213

FIFE SYMINGTON
Governor

GARY K. ROBINSON
State Engineer

LARRY S. BONINE
Director

May 14, 1993

PS/14
Mr. Richard G. Perreault, Chief
Planning Branch
Flood Control District of Maricopa County
2801 West Durango
Phoenix, Arizona 85009

RE: Investigation of the Conceptual Alignment for 100-Year South
Bank Protection from McClintock Dr. to approx. 3,600 Feet East

Dear Dick:

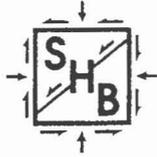
This interim report presents a summary for field investigations performed along the proposed alignment for the 100-year bank protection system in the above referenced area. Field investigation procedures, copies of boring and test pit logs, discussion of results of chemical analyses performed on soil samples, results of soil gas surveys, and estimated costs for three alternatives are presented in this report.

If you have any questions please contact me at 255-7545.

Sincerely,

Terry L. Bourland
Project Manager
Statewide Project Management

cc: Howard Hargis, City of Tempe
Tom Monchak, DMJM



SHB AGRA, INC.
Engineering & Environmental Services

3232 West Virginia Avenue
Phoenix, Arizona 85009
Phone: 602-272-6848
Fax: 602-272-7239

May 13, 1993

DMJM
300 West Clarendon Avenue
Suite 335
Phoenix, Arizona 85013-3499

SHB Job No. E87-56
Letter No. 1119

Attention: Thomas M. Monchak, P.E.

Re: East Papago - Hohokam -
Sky Harbor Freeways
Investigation of the Conceptual
Alignment for 100-Year 215,000
cfs South Bank Protection From
McClintock Drive 3,600 Feet East
Maricopa County, Arizona

Gentlemen:

This interim report presents a summary of the results of field and laboratory investigations performed along the proposed alignment for a 215,000 cfs 100-year bank protection system in the referenced area. Field investigation procedures, copies of boring and test pit logs, discussion of results of chemical analyses performed on soil samples, results of soil gas surveys, and estimated costs for three alternatives for excavation of man-made fills and construction of the bank protection system are presented in this report.



East Papago - Hohokam -
Sky Harbor Freeways
Investigation of the Conceptual
Alignment for 100-Year 215,000
cfs South Bank Protection From
McClintock Drive 3,600 Feet East
Maricopa County, Arizona
SHB Job No. E87-56
Letter No. 1119

Should you have any questions during your review of this report, please do not hesitate in contacting the undersigned.

Respectfully submitted,
SHB AGRA, Inc.

By Charles E. Reynolds
Charles E. Reynolds
Staff Geologist

Reviewed by Nicholas J. LaFrantz
Nicholas J. LaFrantz
Registered Professional Engineer (Civil)
CERTIFICATE NO. 22198
NICHOLAS J. LAFRONZ
Arizona, U.S.A.

Copies: Addressee (3)
Arizona Department of Transportation
Attn: Mr. Steve Jimenez (4)
City of Tempe
Attn: Howard Hargis, P.E. (1)
Maricopa County Flood Control District
Attn: Mr. Don Rerick (1)

k1p/87J-8/4-9-93



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1. INTRODUCTION

This interim report presents the initial results of an environmental investigation conducted along the conceptual alignment of a bank protection system proposed for the south bank of the Salt River, between McClintock Drive in Tempe, Arizona, and a point approximately 3,600 feet east of McClintock Drive. This report also provides preliminary cost estimates and quantities of excavation of man-made fills required for construction of a bank protection system in the referenced area. Man-made fills are comprised of active landfill and river-deposited sediments that contain inert construction debris, rubbish, municipal solid wastes (MSW), rock and soil fill from commercial aggregate operations and potentially hazardous materials.

Inert construction debris is defined as the inorganic fraction of ordinary construction debris. Inert construction debris encountered during field investigations in the study area includes bricks, Portland cement concrete rubble, and glass shards. Rubbish is defined as the non-putrescible organic fraction of ordinary construction debris. Rubbish encountered during field investigations in the study area include wood reels, boards, rebar, cables, landscape rubble, grass clippings, yard trimmings, palm fronds, tree trunks and logs. MSW is defined as household waste including clothing, plastic, paper, glass and wastes resulting from the processing, handling, preparation, cooking, and serving of food.



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Hazardous materials are defined as hazardous substances, pollutants and contaminants. Hazardous substances are defined as presented in Section 101 (14) of CERCLA, 42 U.S.C. § 9601 (14). Pollutant or contaminant is defined in Section 101 (33) of CERCLA, 42 U.S.C. § 9601 (33).

1.1 Objectives

The principal objectives of this investigation were to: 1) collect more detailed data in order to assess the feasibility and cost of excavation and disposal of MSW and other man-made fill materials from the south bank of the Salt River between McClintock Drive and a point approximately 3,600 feet east of McClintock Drive, 2) evaluate the distribution of man-made fill materials along the conceptual alignment to support the design of bank protection to contain flows of up to 215,000 cubic feet per second (cfs) in the Salt River, and 3) search for potentially hazardous material contained within the man-made fill.

1.2 Scope

The investigation along the referenced alignment consisted of shallow soil gas sampling and analysis, exploratory borings and test pit excavations, chemical testing of soil samples, evaluation of findings, and development of estimated excavation volumes of man-made fill and estimated costs for removal of the man-made fills and construction of the south bank protection system in the referenced area.



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2. INVESTIGATION

2.1 Soil Gas Survey

In early November, 1992 and mid-February, 1993, SHB AGRA, Inc. (SHB) and our subcontractor, Hydro Geo Chem (HGC) conducted a soil gas survey on Arizona Department of Transportation (ADOT) parcel Nos. 7-6336, 7-6614, 7-6615, 7-6616, 7-6335 and 7-6617. Samples were collected in accordance with the approved Sampling and Analysis/Work Plan for the Investigation of the Conceptual Alignment of the South Bank Stabilization (SHB Job No. E87-56, Letter No. 1013) at 39 locations (SGA-1 through SGA-39) from a depth of approximately 5 feet below the existing ground surface. On-site mobile laboratory equipment was used to analyze the samples for the following volatile organic compounds (VOCs) (maximum measured concentration):

- Methane (32,521 microgram/liter (ug/l))
- Methylene Chloride (not detected)
- Trichloroethene (not detected)
- Trichloroethane (0.04 ug/l)
- 1,1-Dichloroethene (0.15 ug/l)
- Chloroform (0.04 ug/l)
- Benzene (0.30 ug/l)
- Ethylbenzene (1.23 ug/l)
- Toluene (0.44 ug/l)
- Meta & Para Xylenes (1.88 ug/l)
- Orthoxylenes (0.74 ug/l)

13 VOC's



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- Vinyl Chloride (0.71 ug/l)
- Chloroethene (0.11 ug/l)

Soil gas sampling locations are shown on the site map presented as Sheet No. 1 in the map pocket at the end of this report.

2.2 Soil Borings & Test Pits

In late November, 1992 and late February, 1993, 14 test borings (HB-1 through HB-14, inclusive) were drilled by SHB to depths of 20 to 50.5 feet below existing grades, using a Schramm T64H rotary percussion drill rig. The purpose of these borings was to better define the total thickness of man-made fill deposits and to recover soil samples for chemical analyses. Driven tube samples were recovered at selected intervals in each boring. In addition to the test borings, 15 backhoe test pits (THB-1 through THB-15, inclusive) were excavated using a Link-Belt LS-2650 backhoe to depths of 10 to 19 feet below the existing ground surface along the conceptual alignment of the south bank protection. Test pits were typically 4 to 5 feet wide and 9 to 12 feet long, permitting visual inspection of exposed near-surface materials. Test pit excavation was completed in early March, 1993.

The SHB field engineer continuously observed drilling and test pit operations, visually classified the soils, prepared soil samples for shipment to the analytical laboratory and prepared test boring and test pit logs.



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Results of the field investigation are presented in Appendix A, which includes a brief description of drilling and sampling equipment and procedures and the boring and test pit logs. A site map showing boring and test pit locations is presented as Sheet No. 1 in the map pocket at the end of this report. Coordinates and elevations of the borings and test pits are shown on the logs.

Soil borings and test pits were located in close proximity to locations approved as part of the Sampling and Analysis/Work Plan for the Investigation of the Conceptual Alignment of the South Bank Stabilization (SHB Job No. E87-56, Letter No. 1013). Excavation of test pits and soil borings between McClintock Drive and the Perry Lane Landfill (ADOT parcel 7-6341) was not part of this investigation, due to the availability of sufficient subsurface information from previous investigations and the inundation of the area being covered by river flow during most of the investigation period.

2.3 Sample Collection

Thirty-one soil samples were recovered from man-made fill deposits during the test boring program and submitted to Vista Laboratories, Inc. in Broomfield, Colorado for chemical analyses. Samples were recovered, transported and analyzed in accordance with the approved Sampling and Analysis/Work Plan For Investigation of the Conceptual Alignment of the South Bank Stabilization (SHB Job No. E87-56, Letter No. 1013) and the Field and Analytical Methods (FAM), South Indian Bend Wash Site, EPA, dated May, 1992.



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Soil samples from the test borings were analyzed for hazardous waste properties or constituents using the following test methods:

<u>Laboratory Analysis</u>	<u>EPA Analytical Method</u>
Ignitability	1010
Reactivity (S, CN)	(2)
Metals (TCLP ⁽¹⁾)	6010 ⁽³⁾
Pesticides (TCLP)	8080
Herbicides (TCLP)	8150
Semi-volatiles (TCLP)	8270
Volatiles (TCLP)	8240

- Notes: (1) Toxicity Characteristics Leaching Procedure
 (2) Analysis as directed in Field and Analytical Methods, EPA, 1992.
 (3) EPA Method 7470 for Mercury.

2.3.1 Soil Chemistry

Preliminary review of the analytical testing by TCLP methodology does not indicate the presence of chemical compounds above the reporting limits in soil samples collected during this investigation. Previous investigations conducted in 1988 through 1991, in the same area, using different test methods, reported the presence of various chemical compounds in man-made fills. These compounds included phthalates, pesticides, volatile organic compounds and metals as detailed in Section 3 of this report.



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Requirements established by the FAM stipulated that chemical analysis should be by Toxicity Characteristics Leaching Procedures (TCLP). These analytical procedures attempt to model the leachability of specific analytes in a slightly acidic medium. TCLP testing typically shows compounds at concentrations of 1/20 of those shown by other test methods. Additionally, TCLP analyte lists are significantly smaller than other test methods. TCLP analyte lists typically contain fewer analytes than other test methods. TCLP analyses performed for this investigation may, therefore, have not included constituents previously detected. Additionally, constituent concentrations for previous investigations may have been below reporting limits for TCLP test methods.

3. SITE CONDITIONS & GEOTECHNICAL PROFILE

3.1 Site Conditions

A major portion of the current study area is located within the active Salt River floodplain. The topography of the parcels extending from the Perry Lane Landfill eastward to the Old Tempe Landfill is relatively flat. The northern portions of the parcels drop off steeply to the active channel of the Salt River. The property west of the Perry Lane Landfill that extends to McClintock Drive consists of eroded river floodplain terrace, dropping off gradually to the north into the Salt River channel.



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The elevations of the land surface over the study area vary between approximately 1145 and 1185 feet above sea level. The flat surface of the Perry Lane Landfill, which extends east to the Old Tempe Landfill, ranges in elevation from approximately 1170 to 1185 feet. The north side of these fill deposits drops off steeply to the Salt River channel, to an elevation of about 1150 feet. Elevations for the parcel west of the Perry Lane Landfill range from about 1170 feet on the south side to about 1145 feet on the north side.

The photos presented in Appendix B depict man-made fill materials excavated from selected test pits during this investigation. Photo Nos. 1 through 5, inclusive, depict man-made fill materials recovered from test pits excavated in the area of the Perry Lane Landfill. Photo Nos. 6 through 11, inclusive, depict material excavated from test pits in the area of an inactive construction debris landfill located on ADOT parcels 7-6335 and 7-6617.

The descriptions of land parcels presented below discuss the current site uses, fill material type, and the results of subsurface investigations conducted as part of this and previous studies. Estimated volumes of man-made fill materials, to be removed for construction of a south bank protection system between McClintock Drive and a point approximately 3,600 feet east of McClintock Drive, are presented in Section 4 of this report.



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3.1.1 ADOT Parcel 7-6341 (also known as Maricopa
County Assessor Parcel No. 132-35-00A)

*NOT SHOWN
ON MAP.*

*SEE
REVISED
MAP.*

Parcel 7-6341 is comprised of the Salt River bed and river terrace deposits between the McClintock Drive Bridge and the Perry Lane Landfill. The conceptual alignment for the proposed bank protection system approximately bisects the parcel from north to south. Previous investigations report that the river bed consists of river-deposited fill comprised of sand, gravel and cobbles, construction debris and traces of rubbish and MSW.

Test pits excavated along the conceptual bank alignment, as part of this and previous investigations, indicate 9 to 15 feet of man-made fill. This material overlies coarser sediment consisting of sand, gravel and cobbles that extends to depths of about 100 feet. Soil samples were not recovered as part of this investigation, therefore, no environmental testing was performed. However, previous investigations indicate the presence of phthalates at concentrations of 120 to 4,700 parts per billion (ppb), DDE (dichlorodiphenylchloroethylene) ranging from 14 to 15 ppb, and the metals arsenic (12.3 ppb) and zinc (113.5 ppb) in soils within this parcel.

3.1.2 ADOT Parcel 7-6336 (also known as Maricopa
County Assessor Parcel No. 132-35-03B)

Parcel 7-6336 consists of river bed areas north of the Perry Lane Landfill, extending to the existing ADOT right-of-way. The area of



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excavation of the man-made fill along the proposed hardbank alignment will consist of predominantly river bottom and a small portion of the Perry Lane Landfill that extends into this parcel. The river bottom north of the landfill contains river sediments consisting of sand, gravel and cobbles with traces of construction demolition debris and rubbish. Test borings and test pits excavated as part of this and previous investigations indicate man-made fill deposits varying in thickness from 7 to 35 feet below existing grades. This fill material overlies the previously described native sand, gravel and cobble unit.

Analytical testing by TCLP methods of soil samples recovered from test borings HB-3 and HB-4 during this investigation did not measure any characteristically hazardous constituents. Shallow soil gas samples revealed the presence of traces of benzene, toluene, ethylbenzene and xylene (BTEX) compounds along with methane. Soil gas sample SGA-3 contained a high concentration of methane (17,609 ug/l). Previous investigations indicated the presence of trace amounts of DDE and DDT, Di-N-butyl phthalate, and mercury (0.33 parts per million (ppm)).

3.1.3 ADOT Parcels 7-6614, 7-6615 & 7-6616
(also known as Maricopa County Assessor
Parcel Nos. 132-35-03A, 132-35-13A & 132-35-13B)

These parcels make up the area described by previous investigations as the Perry Lane Landfill. Current activities on these parcels are



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industrial in nature. Parcel 7-6614 is the current site for a concrete batch plant operated by Phoenix Redi-Mix. Activities on parcel 7-6615 involve storage and transfer of paper and plastics prior to recycling. A cabinet manufacturing operation is located on the southern portion of parcel 7-6616, with the remaining portion of the parcel currently unused. The conceptual alignment of the proposed bank protection crosses the northernmost portion of these parcels. In general, the current and previous investigations indicate that the materials in the landfill consist of construction debris, sand, gravel and cobbles, clayey to sandy silts and possibly some pockets of MSW.

The test pits and borings indicate that man-made fill deposits extend to depths of 30 to 45 feet below the existing ground surface.

Analytical testing of soil samples from borings HB-1, HB-2 and HB-5 did not indicate the presence of any characteristically hazardous constituents. Shallow soil gas sampling performed at these parcels revealed trace amounts of 1,1,1-TCA, 1,1-DCE, vinyl chloride, PCE, and chloroform along with small amounts of methane. Soil gas sampled from SGA-10 and SGA-13, however, indicated methane concentrations of 5,762 ug/l and 32,521 ug/l, respectively. Analysis of soil gas sampled from GMW-3 during a previous investigation showed methane concentrations of 8,000 to 11,000 ppm. In addition, trace amounts of BTEX compounds and 1,1-DCE were detected in soil gas samples from GMW-3. Analysis of samples taken from boreholes and test pit excavations as part of previous investigations indicated the presence of



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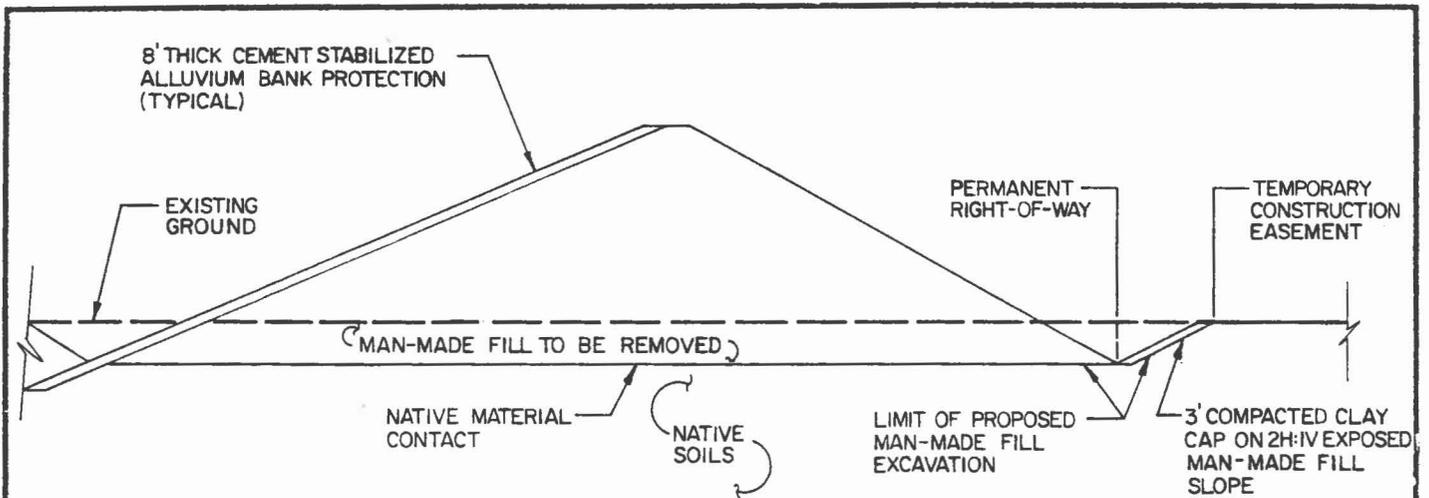
soil gas analysis indicated the presence of trace amounts of chloroform, 1,1,1-TCA, PCE, BTEX compounds and methane. Analyses of soil samples recovered during previous investigations detected the presence of phthalates at a concentration of 2,800 ppb at this parcel.

3.1.5 ADOT Parcel 7-6617 (also known as Maricopa County Assessor Parcel Nos. 132-36-17B & 132-36-03F)

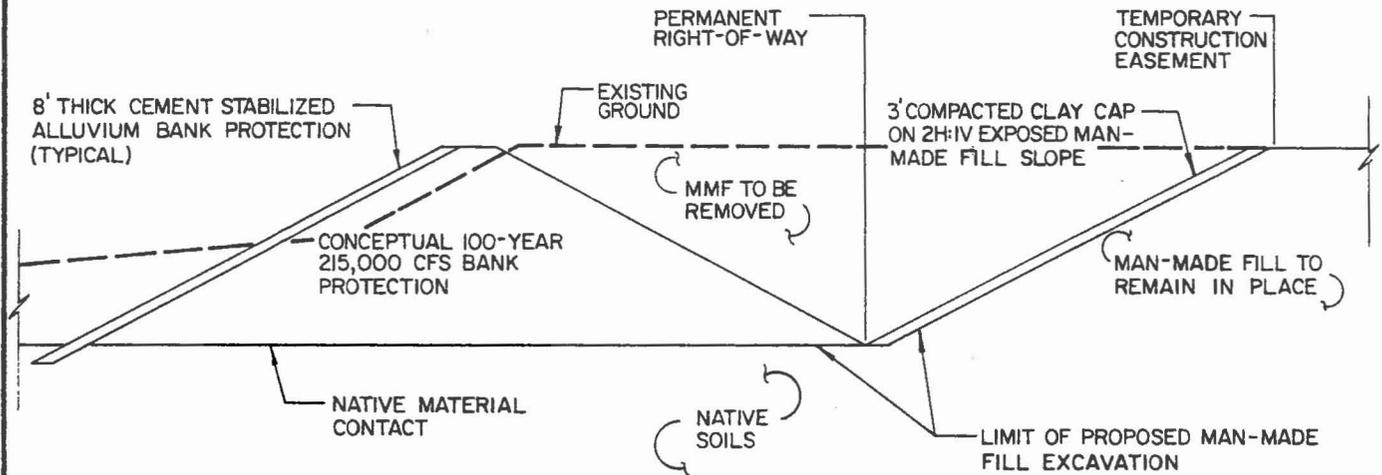
NOT SHOWN ON MAP See Revised map

Parcel 7-6617 consists of the eastern portion of the construction debris landfill described for parcel 7-6336. This parcel extends eastward from parcel 7-6336 to the western limits of the Old Tempe Landfill, and from Pima Street on the south to an area immediately south of the existing ADOT right-of-way and current man-made fill removal operations. Excavation for the current design configuration of the proposed bank protection system will not impact this parcel, due to shoring that will be installed along the current ADOT right-of-way as part of ADOT Project No. RAM-600-05-507. Man-made fills on this parcel are primarily composed of foundry slag, construction debris, rubbish, MSW, silty sand and gravel and sand, gravel and cobbles. Test borings and test pits excavated at this parcel indicate that man-made fill deposits extend to depths of 20 to 33 feet below the existing ground surface.

Analytical testing by TCLP methods of soil samples from borings HB-6, HB-13 and HB-14 did not detect any characteristically hazardous substances within the fill materials located at this parcel. Shallow



CASE 1 - CSA BANK ABOVE EXISTING GRADE
(MCCLINTOCK DRIVE TO PERRY LANE LANDFILL)



CASE 2 - CSA BANK BELOW EXISTING GRADE
(EAST FROM PERRY LANE LANDFILL)

NOT TO SCALE

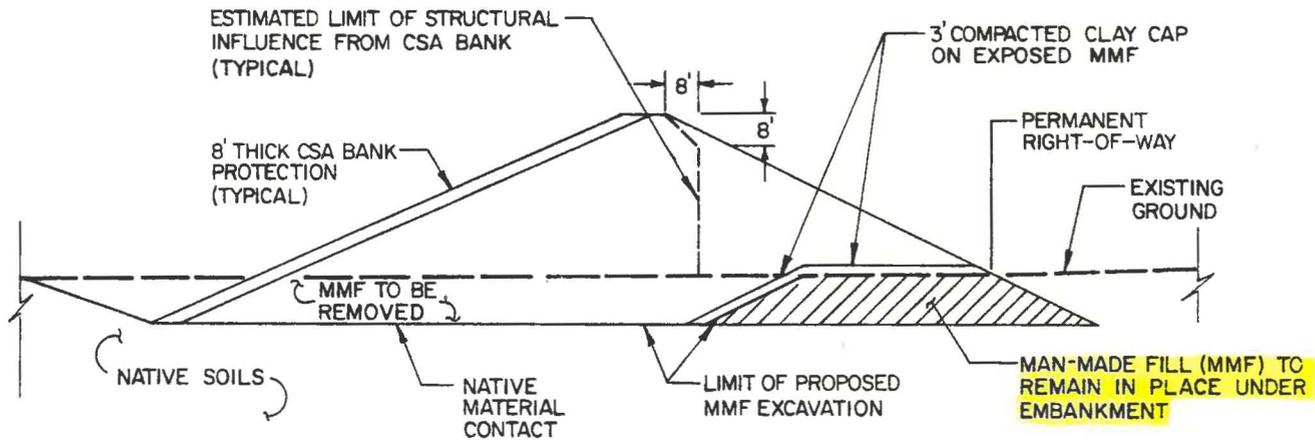
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FIGURE 1 - (ALTERNATIVE 1)

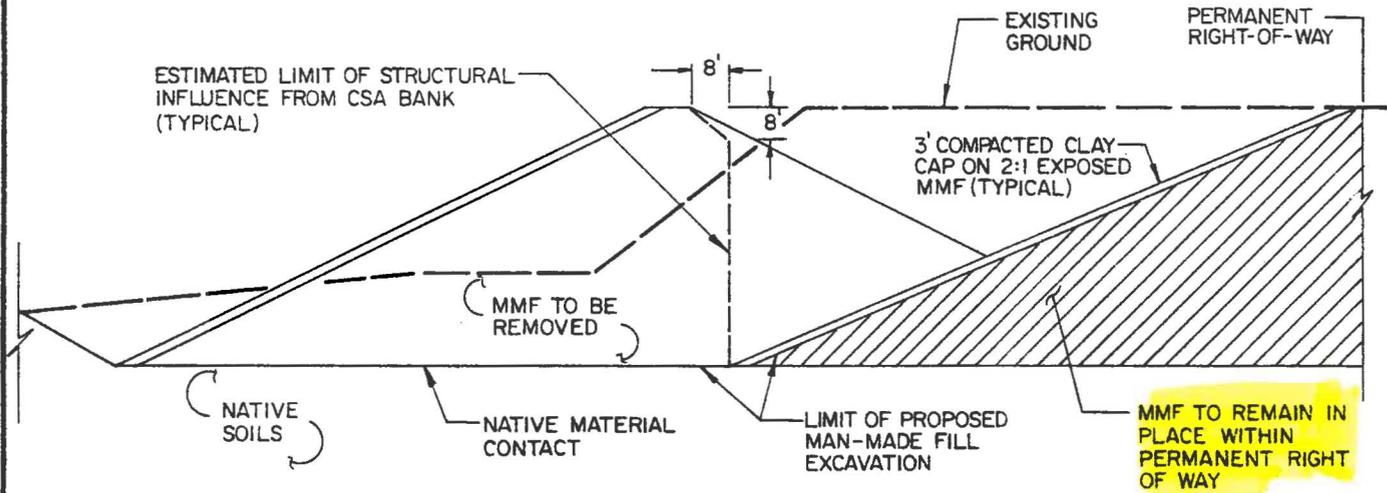
CONCEPTUAL EXCAVATION & RIGHT-OF-WAY CONFIGURATIONS
FOR CONSTRUCTION OF THE 100-YEAR 215,000 CFS
BANK PROTECTION SYSTEM



SHB AGRA, INC.



CASE 1 - CSA BANK ABOVE EXISTING GRADE
 (MCCLINTOCK DRIVE TO PERRY LANE LANDFILL)



CASE 2 - CSA BANK BELOW EXISTING GRADE
 (EAST FROM PERRY LANE LANDFILL)

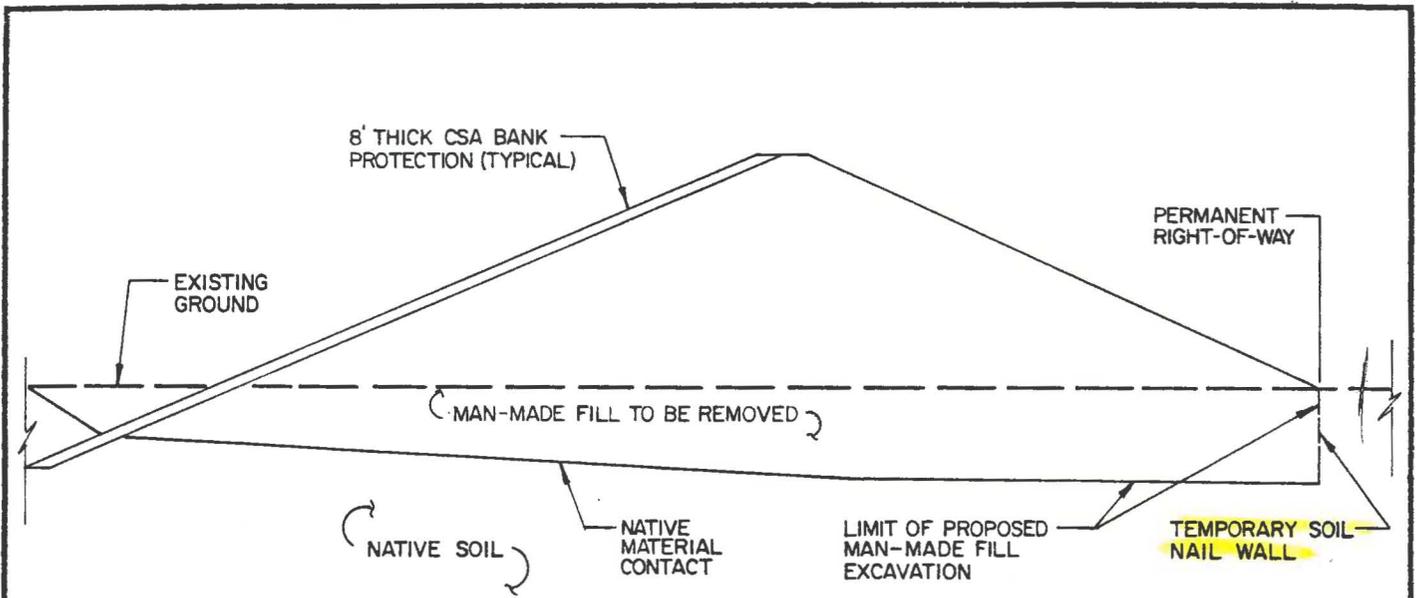
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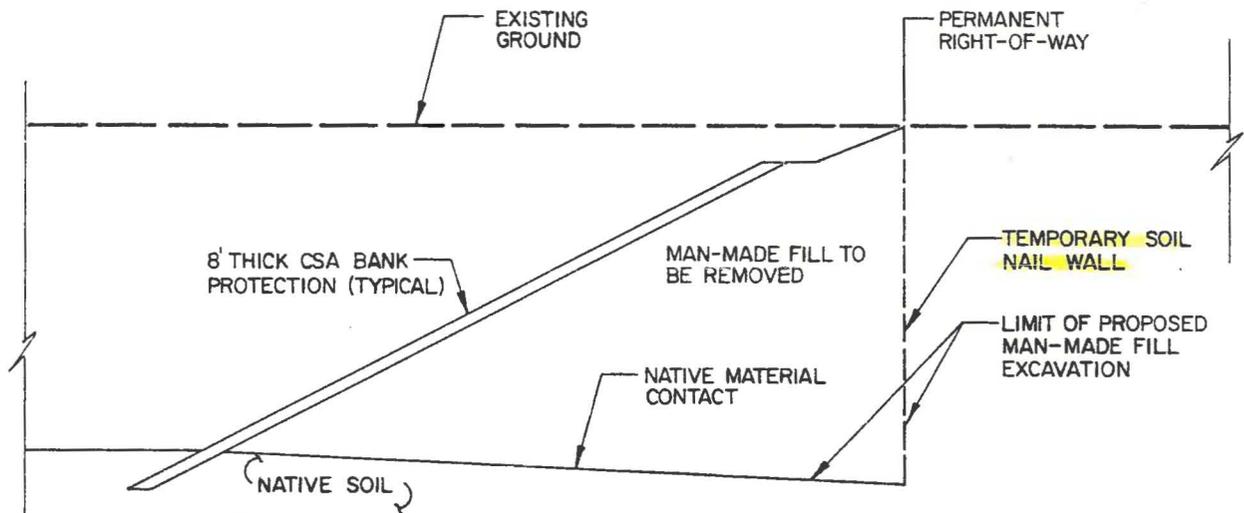
FIGURE 2 - (ALTERNATIVE 2)
 CONCEPTUAL EXCAVATION & RIGHT-OF-WAY CONFIGURATIONS
 FOR CONSTRUCTION OF THE 100-YEAR 215,000 CFS
 BANK PROTECTION SYSTEM



SHB AGRA, INC.



CASE 1 - CSA BANK ABOVE EXISTING GRADE
 (MCCLINTOCK DRIVE TO PERRY LANE LANDFILL)



CASE 2 - CSA BANK BELOW EXISTING GRADE
 (EAST FROM PERRY LANE LANDFILL)

NOTE : SOIL NAIL WALL IS PROPOSED BETWEEN STATIONS 649-000 AND 621-310. CASE 2 OF ALTERNATIVE 2 WILL BE TYPICAL BETWEEN STATIONS 621-310 AND 621-808.

NOT TO SCALE

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FIGURE 3 - (ALTERNATIVE 3)

CONCEPTUAL EXCAVATION & RIGHT-OF-WAY CONFIGURATIONS
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TABLE 1

Estimated Quantity of Excavation From
 Each Parcel Along the Conceptual 100-Year
 Alignment of the Bank Protection System

<u>Parcel No.</u>	<u>Estimated Excavation Volume, c.y.</u>		
	<u>Alternative 1</u>	<u>Alternative 2</u>	<u>Alternative 3</u>
7-6341	179,000	86,000	88,000
7-6614	70,000	47,000	39,000
7-6615	60,000	56,000	45,000
7-6616	39,000	37,000	31,000
7-6335	<u>161,000</u>	<u>99,000</u>	<u>99,000</u>
TOTALS	509,000	325,000	302,000



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fill will remain in the permanent right-of-way as shown in Figure 2.

- All cut slopes in man-made fill materials were estimated at 2:1 (horizontal to vertical), eliminating the requirement for sloping.

4.2.1 Excavation Configurations & Risks

Excavation **Alternative 1** allows for complete removal of man-made fill from the permanent right-of-way. A degree of risk must be accepted, however, to excavate man-made fill materials outside the permanent right-of-way in a Temporary Construction Easement (TCE). Increased total excavation volume proportionally increases the risk of encountering hazardous materials. Long-term risk that must also be accepted includes the potential that at a future date hazardous materials may be identified within the TCE. The agency acquiring the TCE may incur liability for mitigation of identified hazardous materials.

Alternative 2 removes man-made fill from beneath the structural portion of the CSA bank but leaves man-made fills within the permanent right-of-way. The risk of leaving man-made fill within the permanent right-of-way are twofold:

- Long-term maintenance risk associated with possible failure of portions of the bank protection system due to unpredictable behavior of the man-made fills remaining in the permanent right-of-way.
- Long-term environmental risk of future identification of hazardous materials within the right-of-way that may require



the removal of portions of the bank protection system to mitigate the contaminants.

Alternative 3 removes all man-made fills from a large portion of the permanent right-of-way using a soil nail wall to minimize total excavation. The area from approximately Station 621-310 to 621-808 will be excavated as described in Alternative 2. Risk for this area is the same as noted for Alternative 2. Long-term risk is reduced for areas where the soil nail wall can be used to completely remove man-made fills from the permanent right-of-way. Short-term risk is of some concern, however, due to the required augering into man-made fill deposits to anchor the soil nail wall.

why not remove all?

4.3 Cost Estimates

Preliminary cost estimates for removal of man-made fill and construction of a 100-year, 215,000 cfs bank protection system along the South Bank of the Salt River in the referenced area are presented in Appendix D. The cost estimates were based on the following assumptions:

- No cost allowance is provided for handling or disposal of hazardous materials that may be encountered during excavation of man-made fills.
- Excavation of man-made fills will comply with the "Plan for Controlled Removal of Man-Made Fills", SHB Job No. E87-56, Letter No. 870, prepared for ADOT for control of fill excavation within the Indian Bend Wash CERCLA site.
- All exposed landfill faces remaining after construction of the protective bank will be capped.

DO WE HAVE COPY?

- Reduce by back filling



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- o Material excavated for reuse in the construction of the bank protection system will be stockpiled on-site. Material not suitable for construction will be disposed as construction debris, rubbish or MSW, as appropriate, in off-site landfills.
- o The quantity of rubbish and MSW was estimated to be approximately 30 percent of the total fill excavated. This estimate may be significantly revised subsequent to further review of existing data.
- o Placement of fill material behind the bank protection levee is not included. *WHAT IS THE VOLUME REQUIRED TO BACK FILL?*

Alternative 1

The total cost of \$13,586,200.00 is estimated for removal of man-made fills as described for Alternative 1 and construction of the bank protection system in the referenced area.

Alternative 2

Excavation of man-made fills as described for Alternative 2 and construction of the bank protection system is estimated to cost \$9,722,600.00.

Alternative 3

The total cost for removal of man-made fills as described for Alternative 3 and construction of the bank protection system in the referenced area is estimated to be \$9,079,100.00. *\$10.8^m*

These estimated costs are preliminary in nature; actual costs will vary depending on final design configurations, final estimated quantities and actual field conditions encountered during construction.



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5. DISCUSSION & CONCLUSIONS

5.1 Distribution of Man-Made Fills

Man-made fill material along the conceptual alignment of the 100-year 215,000 cfs bank protection system for the south bank of the Salt River, between McClintock Drive and a point 3,600 feet east of McClintock, consists of predominantly construction debris along with varying amounts of MSW and possibly some potentially hazardous materials. A summary of the estimated volumes of man-made fill to be excavated from each parcel is presented in Table 1.

5.2 Summary of Investigation of the South Bank Conceptual Alignment

Results of this investigation of man-made fills along the conceptual alignment of the 215,000 cfs south bank protection are summarized below:

- o The near-surface soils from McClintock Drive to the western boundary of the Perry Lane Landfill consist predominantly of man-made and river-deposited fill up to 15 feet in thickness. Fill material in this area is comprised of sand, gravel and cobbles mixed with rubbish and possibly MSW.
- o The Perry Lane Landfill is comprised of man-made fill deposits that extend to depths of up to 45 feet below the existing ground surface along the conceptual alignment. Fill materials include construction debris, waste rock, sand, gravel and cobbles with some MSW and rubbish, as evidenced by high methane levels at parcels making up the Perry Lane Landfill.



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- o TCLP tests of soil samples recovered during this investigation did not reveal the presence of any characteristically hazardous materials in the study area. Previous investigations indicated the presence of numerous chemical compounds at varying concentrations in the study area. Shallow soil gas analyses performed during this investigation indicated trace concentrations of various organic compounds and several areas having high concentrations of methane.
- o Based upon the results of this investigation, approximately 302,000 to 509,000 cubic yards of man-made fill will require removal prior to construction of the 100-year, 215,000 cfs bank protection system along the currently proposed conceptual alignment, depending on the selected Excavation Alternative.
- o The total estimated costs for three excavation alternatives for removal of the above noted man-made fill and construction of the noted bank protection system are \$13,586,200.00 for Alternative 1; \$9,722,600.00 for Alternative 2; and \$9,079,100.00 for Alternative 3.

\$10.8m



SHB AGRA, INC.
Engineering & Environmental Services



TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Auger Boring Drilling through overburden soils is performed with 6 5/8" O.D., 3 1/4" I.D. hollow stem auger or 4 1/2" solid stem continuous flight auger. Carbide insert teeth are normally used on bits so they can penetrate soft rock or very strongly cemented soils. A CME-55 or CME-75 truck-mounted drill rig is used to advance the auger. The drill rigs are powered with six-cylinder Ford industrial engines capable of delivering about 7,000 to 8,400 foot-pounds torque to the drill spindle. The spindle is advanced with twin hydraulic rams capable of exerting 16,000 to 20,000 pounds downward force.

Generally, refusal to penetration of the auger is adopted as top of the SGC or river-run material, which normally requires other techniques for penetration. Grab samples or auger cuttings may be taken as necessary. Standard penetration tests or 2.42" diameter ring samples are taken in conjunction with the auger borings as needed, with the sampling interval and type being indicated on the boring logs.

Hammer Drill Drilling with the Hammer drill is accomplished with a Drill Systems AP1000 drill rig advancing a double-walled drive casing with a link-belt 180 diesel pile driving hammer, having a rated energy of 8,100 foot-pounds per blow. Where noted on the boring log, the hammer is equipped with a supercharger which can boost the energy to approximately 12,000 foot-pounds per blow. The supercharger is used only in portions of the boring where blow counts are relatively high. Cuttings are removed with compressed air by a reverse circulation process, and are collected in a cyclone from which grab samples are obtained. The drive casing is either 9" O.D. by 6" I.D. or 6 5/8" O.D. by 4" I.D. and employs an expendable bit of slightly larger diameter than the O.D. of the casing. Hammer blows required to advance the drive casing are recorded in 1' increments, as noted on the boring logs. Standard penetration tests or 2.42" diameter ring samples taken are noted on the boring logs.

Odex System The Odex (overburden drilling with the eccentric method) system, also referred to as the DTH (down-the-hole hammer) system, consists of a pneumatic-rotary percussion down-the-hole hammer operating at the bottom being drilled through a 5" diameter steel casing. The eccentric button percussion bit overreams the boreholes and allows advancement of the casing. The same compressed air or air-detergent (foam) mixture that operates the hammer also serves to expel the cuttings from the borehole, where they can be collected as grab samples. Retraction of the eccentric drill bit allows removal of the hammer from the center of the casing to facilitate standard penetration testing (ASTM D1586) where noted on the boring logs.



TEST DRILLING EQUIPMENT & PROCEDURES (CONT.)

Schramm Rotadrill The Schramm T64H truck-mounted drill rig is a top drive rotary rig capable of up to 85,500 inches/pounds of torque with a pulldown capacity of 35,000 lbs. Drilling is performed with either 4", or larger, diameter Tricone roller bits or 4" to 6" diameter down-the-hole hammer. Cutting removal is facilitated by compressed air or air/water mixtures and collected in a cyclone. Where noted on the boring logs, grab samples of the cuttings were collected. When casing is required to stabilize the borehole, an Aardvark drill through casing hammer is utilized, permitting simultaneous drilling and driving of the casing. Casing penetration is recorded on the boring logs in feet per minute. Standard penetration, 2.42" diameter ring samples, Shelby tubes, pitcher tube or Denison samples taken are noted on the boring logs.

Description of Subsurface Exploration Methods (Cont.)

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 test procedure. In many cases, 2" O.D., 1 3/8" I.D. samplers are used to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a casing hammer required to advance the samplers in 6-inch increments. However, in stratified soils, driving resistance is sometimes recorded in 2- or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per 6 inches on the boring logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587), pitcher samplers, Denison samplers or continuous CME samplers. Where samples of rock are required, they are obtained by NQ diamond core drilling (ASTM D2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings. Also, representative samples are obtained from the cuttings from the hammer and Schramm drill rig.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares the boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the boring logs.

clj/M1-92/02-14-92

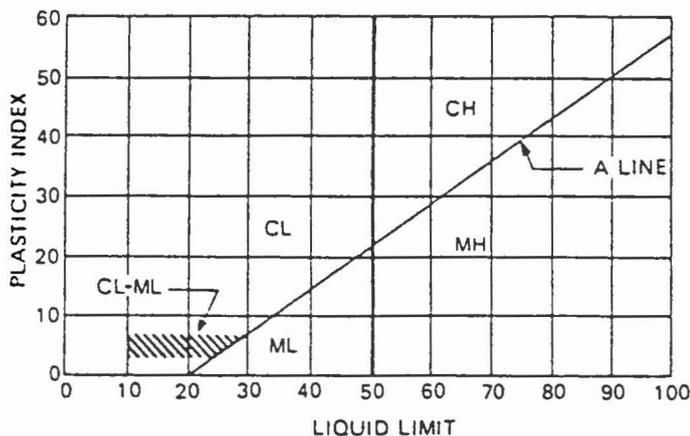
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS		GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)	GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	GM	Silty gravels, gravel-sand-silt mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)	SW	Well graded sands, gravelly sands.
		CLEAN SANDS (Less than 5% passes No. 200 sieve)	SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	SM	Silty sands, sand-silt mixtures.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	ML	Inorganic silts, clayey silts with slight plasticity.	
	SILTS (LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.	
	CLAYS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.	

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve





TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY,
CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

1. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand-gravel mixtures.

<u>N</u>	<u>Relative Density</u>
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

<u>N</u>	<u>Relative Consistency</u>	<u>Remarks</u>
0-2	Very soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16-30	Very stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and/or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils.

<u>N</u>	<u>Relative Firmness</u>
0-4	Very soft
5-8	Soft
9-15	Moderately firm
16-30	Firm
31-50	Very firm
50+	Hard

elj/M1-92/02-14-92

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank

LOG OF TEST BORING NO. HB-1

JOB NO. E87-56 DATE 11-16-92

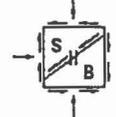
Location N885843 E504187

RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion
 SURFACE ELEV. 1175.7'
 DATUM Anderson Nelson Survey

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings	DVA Meter Readings	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									slightly moist to moist	Man-made FILL SILTY SAND, GRAVEL & COBBLES , predominantly coarse grained subrounded gravel, well graded subangular to subrounded sand, nonplastic to low plasticity, dark yellowish brown note: considerable voids from 5' to 15' & at 30'; wood fragments from 10' to 19' & at 25' note: considerable organics, paper, plastic & concrete fragments
2.0										
5	1.0					0.0			medium dense to very dense	
10			U	62	0.0		GM			
15	0.3									
20						0.0				
25	15.0					0.0				
30	7.0		U	3-0-0	0.0				very moist to wet	Man-made FILL CLAY , medium to high plasticity, dark brown note: possible concrete washout materials note: organics odor with black streaks & some gray silty lenses at 40'
35	1.0						CH		very soft	
40			U	0	0.0					
45						0.0				
50	3.5		U	45-75-60	0.0		GW			NATIVE SAND, GRAVEL & COBBLES , some silt, predominantly coarse grained gravel, well graded sand, nonplastic, dark brown

GROUNDWATER		
DEPTH	HOUR	DATE
38.0	8:00a	11-17-92

- SAMPLE TYPE
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



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PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank

LOG OF TEST BORING NO. HB-2

JOB NO. E87-56 DATE 11-18-92

Location N885745 E504269

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample Type	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classifi- cation
0								
5	1.5					0.8		
10			U	8				GM/ SM
15	0.8							
20						0.2		
25	5.0							
30	0.8		U	15-6-1		0.5		CH
35	1.0							SP
40								GM
45			U	56		0.2		
50								

RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion
 SURFACE ELEV. 1176.0'
 DATUM Anderson Nelson Survey

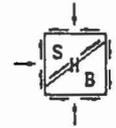
REMARKS	VISUAL CLASSIFICATION
slightly moist to moist	Man-made FILL SILTY SAND & GRAVEL , trace of small cobbles, well graded subangular to subrounded gravel, predominantly fine grained sand, low plasticity to nonplastic, grayish black to black
medium dense to very dense	note: no returns from 20' to 25'
	note: considerable concrete, wood & some plastic
very moist, moderately stiff	Man-made FILL CLAY , medium to high plasticity, dark brown note: organics odor
very moist, medium dense to dense	Man-made FILL GRAVELLY SAND , some clay, predominantly fine to medium grained, subangular to subrounded, nonplastic, dark brown
very moist very dense	SAND, GRAVEL & COBBLES , predominantly coarse grained subrounded gravel, well graded subangular to subrounded, sand, nonplastic, dark brown
	Stopped Drill at 44' Stopped Sampler at 45'

GROUNDWATER

SAMPLE TYPE

DEPTH	HOUR	DATE
41.0	12:00p	11-18-92

- A - Drill Cuttings
- S - 2" O.D. 1.38" I.D. tube sample.
- U - 3" O.D. 2.42" I.D. tube sample.
- T - 3" O.D. thin-walled Shelby tube.



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PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank

LOG OF TEST BORING NO. HB-3

JOB NO. E87-56 DATE 11-19-92

Location N885910 E504314

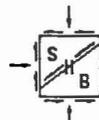
Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	DVA Meter Readings:	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0									slightly moist	Man-made FILL SILTY SAND, GRAVEL & COBBLES , well graded subrounded gravel, well graded subangular to subrounded sand, nonplastic to low plasticity, dark brown to brown note: concrete fragments, metal & asphaltic concrete fragments note: trace of clay below 10' increasing with depth note: plastic & paper at 25' note: predominantly sand & gravel below 30'
10	1.0		U	10	0.0					
15										
20						0.0				
25	2.5									
30	2.0		U	8-18-15	0.9					
35	4.0					0.0			very moist	
40	1.5									
45			U	4 1/9"						
50										
										Stopped Drill at 44' Stopped Sampler at 44'9"

GROUNDWATER

SAMPLE TYPE

DEPTH	HOUR	DATE
41.0	none	

- A - Drill Cuttings
- S - 2" O.D. 1.38" I.D. tube sample.
- U - 3" O.D. 2.42" I.D. tube sample.
- T - 3" O.D. thin-walled Shelby tube.



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PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank

LOG OF TEST BORING NO. HB-4

JOB NO. E87-56 DATE 11-20-92

Location N885911 E504202

RIG TYPE	<u>Schramm T64H</u>
BORING TYPE	<u>6" Dual Percussion</u>
SURFACE ELEV.	<u>1174.3'</u>
DATUM	<u>Anderson Nelson Survey</u>

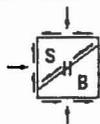
Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						0.0			moist	Man-made FILL CLAYEY SAND & GRAVEL , predominantly coarse grained subrounded gravel, predominantly fine to medium grained sand, medium plasticity, dark brown note: interbedded with clayey sand layers; some voids from 10' to 30'
5	0.5					1.0		very soft to very firm		
10			U	0						
15	1.0							GC/ SC- CL		
20										
25										
30	1.5		U	30						
35								GP	moist	SAND, GRAVEL & COBBLES , predominantly coarse grained subrounded gravel, predominantly fine to medium grained sand, nonplastic to low plasticity, dark brown
40			U	7-28- 50		0.0			very dense	
45										Stopped Drill at 39' Stopped Sampler at 40'6"
50										

GROUNDWATER

SAMPLE TYPE

DEPTH	HOUR	DATE
37.0	3:00p	11-20-92

- A - Drill Cuttings
- S - 2" O.D. 1.38" I.D. tube sample.
- U - 3" O.D. 2.42" I.D. tube sample.
- T - 3" O.D. thin-walled Shelby tube.



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PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 11-23-92

LOG OF TEST BORING NO. HB-5

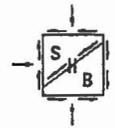
Location N885836 E504957

RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion
 SURFACE ELEV. 1185.0'
 DATUM Anderson Nelson Survey

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						1.0			moist	Man-made FILL CLAYEY SAND & GRAVEL , predominantly coarse grained gravel, predominantly medium grained subangular to subrounded sand, medium to high plasticity, dark brown note: voids present from 10' to 15'
5	0.5							SC/GC	medium dense to dense	
10				U 5-7-7						
15										
16	6.0								moist	Man-made FILL SILTY SAND, GRAVEL & COBBLES , predominantly coarse grained subrounded gravel, well graded subangular to subrounded sand, nonplastic to low plasticity, dark brown note: some plastic at 30'
17	15.0					1.2			very dense	
18	5.0					2.3				
25	10.0					2.2		GM		
30				U 57/18"						
35						5.3				
36						7.7				
40	1.0							SP	moist dense	Man-made FILL SAND , some silt, predominantly fine to medium grained, subangular to subrounded, nonplastic, dark brown
45						0.5				
47	5.0							GP-GM	very moist to moist, very dense	SAND, GRAVEL & COBBLES
50				U 23-39-70						

GROUNDWATER		
DEPTH	HOUR	DATE
47.0	11:30a	11-24-92

- SAMPLE TYPE
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



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PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 11-23-92

LOG OF TEST BORING NO. HB-5

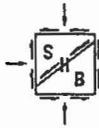
Location N885836 E504957

RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion
 SURFACE ELEV. 1185.0'
 DATUM Anderson Nelson Survey

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
50									wet	SAND, GRAVEL & COBBLES, some to considerable silt, predominantly coarse grained subrounded gravel, well graded subangular to subrounded sand, nonplastic, dark brown
55									very dense	
60										Stopped Drill at 49' Stopped Sampler at 50'6"
65										
70										
75										
80										
85										
90										
95										
100										

GROUNDWATER		
DEPTH	HOUR	DATE
47.0	11:30a	11-24-92

- SAMPLE TYPE
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



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PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 2-22-93

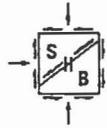
LOG OF TEST BORING NO. HB-6
 Location N885808 E505509

RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion Hammer
 SURFACE ELEV. 1173.3'
 DATUM Anderson Nelson Survey

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PTD Meter Readings:	OVA Meter Readings:	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									moist to wet very soft	Man-made FILL SANDY GRAVEL , some silt, fine to coarse grained subangular gravel, predominantly medium to coarse grained subangular sand, nonplastic, brown note: void 10' to 12'
10			U	0	0.0	GP				
			U	2						
15										
20			U	2	0.0					
25										
30										
35							GP			
40										
45										
50										

GROUNDWATER		
DEPTH	HOUR	DATE
10.0	1:30p	2-22-94

- SAMPLE TYPE**
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



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PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank

LOG OF TEST BORING NO. HB-7

JOB NO. E87-56 DATE 2-23-93

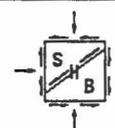
Location N885755 E504900

RIG TYPE	<u>Schramm T64H</u>
BORING TYPE	<u>6" Dual Percussion Hammer</u>
SURFACE ELEV.	<u>1172.3'</u>
DATUM	<u>Anderson Nelson Survey</u>

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PTD Meter Readings:	OVA Meter Readings:	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION	
0									moist very dense to medium dense	FILL GRAVELLY SAND , considerable silt, trace of clay, some lime, nonplastic to low plasticity, brown note: void from 4' to 5' note: concrete block from 6' to 10' note: some black clay, traces of paper & some wood at 20'	
5					0.5						
10					0.0		SP				
20				U 17	2.0						
22				U 14							
25											
30											
35							CL	wet			SILTY CLAY, some sand, medium plasticity, brown
38								firm			
40					U 40			GP			wet
42								hard			
45									Stopped Drill at 40' Stopped Sampler at 41'6"		
50											

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

- SAMPLE TYPE
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-12
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX · TUCSON · ALBUQUERQUE
 RENO/SPARKS · EL PASO · MEXICO
 SALT LAKE CITY · LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 2-24-93

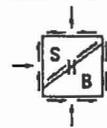
LOG OF TEST BORING NO. HB-8

Location N885788 E504800
 RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion Hammer
 SURFACE ELEV. 1172.4'
 DATUM Anderson Nelson Survey

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION	
0									moist to wet	Man-made FILL GRAVELLY SAND , trace of silt, predominantly coarse grained subrounded gravel, predominantly fine to medium grained subangular sand, some lime, nonplastic to low plasticity, brown note: traces of wood, plastic & concrete note: large voids from 15' to 30' note: butane odor noted by cyclone from 33' to 34'	
5								loose to medium dense			
10				U 21							
15											
20				U 8							
25											
30											
35											
40				U 65- 140/6"					wet very dense		SAND, GRAVEL & COBBLES , some silt, subrounded to rounded gravel & cobbles, medium grained sand, nonplastic, brown
45									Stopped Drill at 40' Stopped Sampler at 41'6"		
50											

GROUNDWATER		
DEPTH	HOUR	DATE
21.0	10:00a	2-24-93

- SAMPLE TYPE
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-13
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 11-16-92

LOG OF TEST BORING NO. HB-1

Location N885843 E504187
 RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion
 SURFACE ELEV. 1175.7'
 DATUM Anderson Nelson Survey

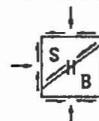
Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
50										
										Stopped Drill at 49' Stopped Sampler at 50'6"
55										
60										
65										
70										
75										
80										
85										
90										
95										
100										

GROUNDWATER

DEPTH	HOUR	DATE
38.0	8:00a	11-17-92

SAMPLE TYPE

- A - Drill Cuttings
- S - 2" O.D. 1.38" I.D. tube sample.
- U - 3" O.D. 2.42" I.D. tube sample.
- T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-15

ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX · TUCSON · ALBUQUERQUE
 RENO/SPARKS · EL PASO · MEXICO
 SALT LAKE CITY · LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 2-25-93

LOG OF TEST BORING NO. HB-10

Location N885847 E505372

Depth In Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classification
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RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion Hammer
 SURFACE ELEV. 1167.0'
 DATUM Anderson Nelson Survey

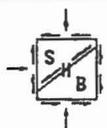
									REMARKS	VISUAL CLASSIFICATION
0									moist	Man-made FILL SAND, trace of silt, medium to fine grained, nonplastic to low plasticity, dark brown note: some plastic at 10'
5								SP	soft to moderately firm	
10				U13/1'6"						
15										
20				60- U 20/4"				GP	wet	
25									very dense	
30										
35										
40										
45										
50										Stopped Drill at 20' Sampler refused at 21'4"

GROUNDWATER

DEPTH	HOUR	DATE
15.0	12:00p	2-25-93

SAMPLE TYPE

- A - Drill Cuttings
- S - 2" O.D. 1.38" I.D. tube sample.
- U - 3" O.D. 2.42" I.D. tube sample.
- T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-16

ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 2-25-93

LOG OF TEST BORING NO. HB-11

Location N885846 E505365
 RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion Hammer
 SURFACE ELEV. 1167.1'
 DATUM Anderson Nelson Survey

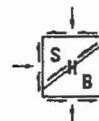
Depth In Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION	
0									moist	Man-made FILL SAND , trace of silt, predominantly fine to medium grained, subangular fine grained gravel, nonplastic to low plasticity, dark brown note: traces of wood, metal & foundry slag note: voids from 10' to 14' note: traces of plastic & styrofoam debris from 14' to 17'	
5											
10											
15						0.5					
20				U 53/1'3"		0.3			wet very dense		
25											
30								GP			
35											
40											
45											
50											
											Stopped Drill at 45'

GROUNDWATER

SAMPLE TYPE

DEPTH	HOUR	DATE
14.0	3:45p	2-25-93

- A - Drill Cuttings
- S - 2" O.D. 1.38" I.D. tube sample.
- U - 3" O.D. 2.42" I.D. tube sample.
- T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-17

ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX · TUCSON · ALBUQUERQUE
 RENO/SPARKS · EL PASO · MEXICO
 SALT LAKE CITY · LAKEWOOD/DENVER

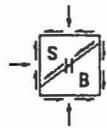
PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-3-93

Page 1 of 1
LOG OF TEST BORING NO. HB-12
 Location N885814 E504522

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample Type	Sample Type Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0									
0.5								slightly moist to moist	Man-made FILL SAND & GRAVEL, some silt, predominantly medium to coarse grained subangular to aubrounded sand, predominantly fine grained subangular to subrounded gravel, trace of lime, nonplastic, brown
5								medium dense to dense	
10	1.0		U			2.0			
15									
20			U	20	0.6	0.5	GM	slightly moist to very moist	FILL SILTY GRAVEL, some sand & trace of small cobbles, predominantly coarse grained, subangular to subrounded, nonplastic, brown
25	0.5							wet below 25'	Man-made FILL SAND, some fine grained gravel, predominantly fine to medium grained, nonplastic, dark brown to brown note: voids present from 34' to 36'
30			U	12	2.0	2.0	SP	medium dense	
35	0.1								
40	1.5		U		0.0	0.0	GP	wet very dense	SAND, GRAVEL & COBBLES, trace of boulders, fine to medium grained sand, predominantly coarse grained subangular to subrounded gravel, nonplastic, yellowish brown
45									Stopped Drill at 39'2"
50									

GROUNDWATER		
DEPTH	HOUR	DATE
25.0	12:30p	3-3-93

- SAMPLE TYPE
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-18
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX · TUCSON · ALBUQUERQUE
 RENO/SPARKS · EL PASO · MEXICO
 SALT LAKE CITY · LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-3-93 & 3-4-93

LOG OF TEST BORING NO. HB-13

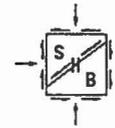
Location N885776 E505268

RIG TYPE	<u>Schramm T64H</u>
BORING TYPE	<u>6" Dual Percussion Hammer</u>
SURFACE ELEV.	<u>1167.8'</u>
DATUM	<u>Anderson Nelson Survey</u>

Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample	Sample Type	Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									moist medium dense to very dense	Man-made FILL SILTY SAND & GRAVEL , trace of cobbles with occasional boulders, predominantly coarse grained subangular to subrounded gravel, predominantly fine to medium grained sand, some lime, low plasticity, dark brown
0.3										
5						0.0	0.0	SM/ GM		
10				U	15	0.0				
15	0.7								wet very dense to medium dense	Man-made FILL SILTY SAND, GRAVEL & COBBLES , occasional small boulders, predominantly coarse grained subrounded gravel, predominantly fine to medium grained sand, nonplastic, brown note: metal fragments from 20' to 30' (fencing)
20				U	12					
25								GM		
30				U	10					
35	1.5							GM/ GP	wet very dense	SAND, GRAVEL & COBBLES , trace of boulders, predominantly coarse grained subrounded gravel, predominantly fine to medium grained sand, nonplastic, dark brown
40				U	76	0.8				
45									Stopped Drill at 39' Stopped Sampler at 40'6"	
50										

GROUNDWATER		
DEPTH	HOUR	DATE
17.0	8:00a	3-4-93

- SAMPLE TYPE
- A - Drill Cuttings
 - S - 2" O.D. 1.38" I.D. tube sample.
 - U - 3" O.D. 2.42" I.D. tube sample.
 - T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-19
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX · TUCSON · ALBUQUERQUE
 RENO/SPARKS · EL PASO · MEXICO
 SALT LAKE CITY · LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-4-93

LOG OF TEST BORING NO. HB-14

Location N885734 E505159
 RIG TYPE Schramm T64H
 BORING TYPE 6" Dual Percussion Hammer
 SURFACE ELEV. 1170.7'
 DATUM Anderson Nelson Survey

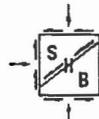
Depth in Feet	Drill Rate Min/Ft	Graphical Log	Sample Type	Sample Type Blow Count Casing Hammer	PID Meter Readings:	OVA Meter Readings:	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION	
0								very moist to moist loose to dense note: grading to clayey sand & gravel below 8' note: grading locally to a silty sand & gravel below 14' note: some cobbles below 18'	Man-made FILL SILTY SAND & GRAVEL , predominantly fine grained subangular to subrounded sand & gravel, low plasticity, brown to reddish brown note: grading to clayey sand & gravel below 8' note: grading locally to a silty sand & gravel below 14' note: some cobbles below 18'	
5	0.5					SM/ GM				
10			U	3	0.0					
15	0.6				0.6					
20			U	52	0.6	0.6				
25	1.0					GP				
30			U	53						
35							Stopped Drill at 29' Stopped Sampler at 30'			
40										
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
19.0	12:25p	3-4-93

SAMPLE TYPE

- A - Drill Cuttings
- S - 2" O.D. 1.38" I.D. tube sample.
- U - 3" O.D. 2.42" I.D. tube sample.
- T - 3" O.D. thin-walled Shelby tube.



SHB AGRA, INC. A-20

ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX · TUCSON · ALBUQUERQUE
 RENO/SPARKS · EL PASO · MEXICO
 SALT LAKE CITY · LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-10-93

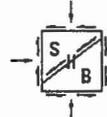
LOG OF TEST PIT NO. THB-1

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885781 E505592
 ELEVATION 1182.9'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent dry weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					SM/ GM	slightly moist	Man-made FILL SILTY SAND & GRAVEL , predominantly fine to medium grained sand, fine grained subrounded to subangular gravel, some lime, low plasticity, brown note: considerable concrete & construction debris consisting of rags, wood, etc.
5					GM	slightly moist to moist	Man-made FILL SILTY SAND, GRAVEL & COBBLES , occasional small boulders, predominantly coarse grained subrounded gravel, fine to medium grained subangular to subrounded sand, nonplastic to low plasticity, brown to dark brown
10							
15							
20							Stopped Backhoe at 19'
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-21
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-10-93

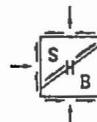
LOG OF TEST PIT NO. THB-2

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885757 E504921
 ELEVATION 1172.0'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent Dry Weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	Man-made FILL SILTY SAND & GRAVEL, trace of cobbles, predominantly coarse grained subrounded to angular gravel, fine to medium grained sand, some lime, low plasticity, dark brown to gray note: considerable concrete fragments, brick, wire & metal pipe
5					GM/ SM		
10							
15							Stopped Backhoe at 13'
20							
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-22
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-10-93

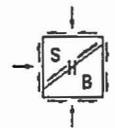
LOG OF TEST PIT NO. THB-3

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885837 E505275
 ELEVATION 1168.4'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent Dry Weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to moist	Man-made FILL SILTY SAND & GRAVEL grading locally to a CLAYEY SAND & GRAVEL , trace of small cobbles, well graded, subangular to subrounded, low plasticity, dark brown note: foundry slag from 0 to 2' note: some concrete blocks mixed with foundry slag from 2' to 8' note: OVA reading of spoil pile = 0.8 ppm
5					SM/ GM- SC/ GC		
10							
15					GP	slightly moist	NATIVE SAND, GRAVEL & COBBLES , trace of boulders, predominantly coarse grained subrounded gravel, medium to coarse grained subangular to subrounded sand, nonplastic, light brown note: maximum estimated particle size of 14" to 16"
20							Stopped Backhoe at 14'6"
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-23
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-11-93

LOG OF TEST PIT NO. THB-4

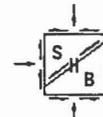
BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885845 E505407
 ELEVATION 1168.1'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
17.0	1:20p	3-10-93

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent of dry weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0					SM/ GM	slightly moist to moist	Man-made FILL SILTY SAND & GRAVEL , trace of cobbles, predominantly fine grained subrounded to subangular gravel, fine to medium grained sand, some lime, nonplastic to low plasticity, dark gray note: some foundry slag
5					SC- CL	moist	Man-made FILL CLAYEY SAND grading locally to a SANDY CLAY , some gravel, well graded sand, considerable lime, medium plasticity, brown note: considerable construction debris, rags & plastic
10							
15					GP	wet	SAND, GRAVEL & COBBLES , predominantly coarse grained subrounded gravel, medium to coarse grained sand, nonplastic, brown
20							Stopped Backhoe at 18'6"
25							

SAMPLE TYPE

- B - Undisturbed Block Sample.
- D - Disturbed Bulk Sample.
- J - Jar Sample
- G - Grab Sample



SHB AGRA, INC. A-24

ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-10-93

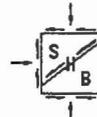
LOG OF TEST PIT NO. THB-5

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885828 E504813
 ELEVATION 1172.9'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content Percent Dry Weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to moist	Man-made FILL SILTY SAND & GRAVEL , trace to some cobbles, predominantly well graded subrounded to subangular sand & gravel, some lime, low plasticity, brown note: considerable concrete, reinforcing rods, bricks, wood & wire cable note: PID reading = 1.5 ppm
5					SM/ GM		
10							Backhoe refused at 10'
15							
20							
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-25
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-11-93

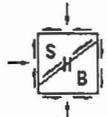
LOG OF TEST PIT NO. THB-6

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885836 E504689
 ELEVATION 1173.7'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						slightly moist	Man-made FILL SILTY SAND & GRAVEL , trace of small cobbles, well graded subrounded gravel, predominantly fine to medium grained sand, some lime, low plasticity, light yellowish brown note: considerable concrete blocks (maximum estimated particle size of 3" to 5"), reinforcing rods & cable note: PID reading of spoil pile = 0.1 to 0.5 ppm
5					SM/ GM		
10							
15							Stopped Backhoe at 15'
20							
25							

- SAMPLE TYPE**
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-26
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-11-93

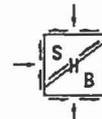
LOG OF TEST PIT NO. THB-7

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885836 E504618
 ELEVATION 1173.4'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent dry weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						moist	Man-made FILL SILTY SAND & GRAVEL , trace of clay & small cobbles, well graded subrounded gravel, predominantly fine to medium grained subangular to subrounded sand, some lime, low plasticity, brown to light brown note: considerable concrete blocks & wire cable note: PID reading of spoil pile = 0.4 to 0.5 ppm
5					SM/ GM		
10							
15							Stopped Backhoe at 11'
20							
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-27
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-11-93

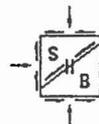
LOG OF TEST PIT NO. THB-8

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885888 E504530
 ELEVATION 1169.4'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						moist	Man-made FILL SILTY SAND & GRAVEL grading locally to SAND & GRAVEL, some to considerable small cobbles, predominantly fine to medium grained sand, predominantly coarse grained subrounded to subangular gravel, trace of lime, nonplastic to low plasticity, light yellowish brown note: PID reading of excavation = 0.5 to 0.7 ppm
5					SM/ GM- SP/ GP		
10							
15							Stopped Backhoe at 13'
20							
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-28
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-11-93

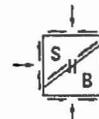
LOG OF TEST PIT NO. THB-9

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885879 E504423
 ELEVATION 1176.1'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent dry weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to moist	Man-made FILL SILTY SAND & GRAVEL , trace of small cobbles, predominantly fine to medium grained sand & fine grained subangular to subrounded gravel, some lime, low plasticity, brown note: concrete fragments throughout
5						moist to very moist	Man-made FILL SILTY GRAVEL , trace of small cobbles, predominantly coarse grained, subrounded, nonplastic, light yellowish brown note: considerable asphalt & concrete blocks with some organic material & carpet note: trace of clay below 5' note: PID reading of spoil pile = 0.2 to 0.6 ppm
10							
15							
20							Stopped Backhoe at 18'6"
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-29
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-11-93

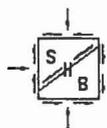
LOG OF TEST PIT NO. THB-10

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885716 E504417
 ELEVATION 1176.6'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent Dry Weight	Unified Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0					SP	moist	Man-made FILL SAND, some silt, some to considerable fine grained gravel, predominantly medium to coarse grained subangular to subrounded, trace of lime, nonplastic, brown
5					GP	moist to very moist	Man-made FILL SAND, GRAVEL & COBBLES, occasional small boulders, predominantly coarse grained subrounded gravel, medium to coarse grained subangular to subrounded sand, nonplastic, brown note: trace of garbage & plastic
10							
15							
20							
25							Stopped Backhoe at 13'

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-30
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-11-93

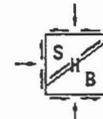
LOG OF TEST PIT NO. THB-11

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885923 E504229
 ELEVATION 1176.1'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent of dry weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						moist to slightly moist	Man-made FILL SILTY SAND & GRAVEL , trace of small cobbles & clay, predominantly fine grained subrounded to subangular gravel, well graded sand, some lime, nonplastic to low plasticity, brown to dark brown note: some concrete blocks up to 2' to 4' & other construction debris
5					SM/ GM		
10							
15							
20							Stopped Backhoe at 19'
25							

- SAMPLE TYPE**
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-31
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-12-93

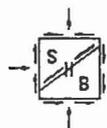
LOG OF TEST PIT NO. THB-12

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885824 E504114
 ELEVATION 1183.9'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture content percent Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					GC	moist	Man-made FILL CLAYEY SAND, GRAVEL & COBBLES, well graded subrounded to subangular sand & gravel, some lime, low plasticity, brown
5					SC/ GC	moist	Man-made FILL CLAYEY SAND & GRAVEL, trace of small cobbles, well graded subangular to subrounded sand & gravel, some lime, low plasticity, dark brown note: concrete blocks from 10' to 13'
10							
15							Stopped Backhoe at 13'
20							
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-32
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-12-93

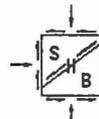
LOG OF TEST PIT NO. THB-13

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885833 E503885
 ELEVATION 1183.7'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent Dry Weight	Unified Soil Classifi- cation	REMARKS	VISUAL CLASSIFICATION
0						moist	Man-made FILL SILTY SAND, GRAVEL & COBBLES , predominantly coarse grained subrounded gravel, well graded subrounded to subangular sand, some lime, low plasticity, light yellowish brown note: trace of concrete fragments on surface
5					GM	moist	Man-made FILL SILTY SAND & GRAVEL , well graded subrounded gravel, predominantly fine to medium grained sand, some to considerable lime with moderately cemented fragments of caliche, low plasticity, brown
10					SM/ GM		
15							
20							Stopped Backhoe at 18'
25							

- SAMPLE TYPE**
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-33
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-12-93

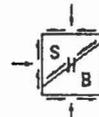
LOG OF TEST PIT NO. THB-14

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885745 E503818
 ELEVATION 1177.6'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						slightly moist to moist	Man-made FILL SILTY SAND & GRAVEL, trace of small cobbles, predominantly fine to medium grained sand & fine grained subangular to subrounded gravel, some lime, low plasticity, brown
5					SM/GM		
10					GM	moist	SILTY SAND, GRAVEL & COBBLES, occasional boulders, predominantly coarse grained subrounded gravel, medium to coarse grained sand, some lime, low plasticity, light brown note: trace of concrete blocks throughout with other construction debris note: maximum estimated particle size of 18" to 24"
15							Stopped Backhoe at 11'6"
20							
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-34
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX • TUCSON • ALBUQUERQUE
 RENO/SPARKS • EL PASO • MEXICO
 SALT LAKE CITY • LAKEWOOD/DENVER

PROJECT East Papago Freeway 215,000 CFS
Conceptual Alignment South Hardbank
 JOB NO. E87-56 DATE 3-12-93

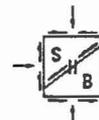
LOG OF TEST PIT NO. THB-15

BACKHOE TYPE Link-Belt LS-2650
 LOCATION N885647 E503821
 ELEVATION 1175.2'
 DATUM Anderson Nelson Survey

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					SM/GM	moist	Man-made FILL SILTY SAND & GRAVEL, trace of clay, predominantly fine grained gravel, fine to medium grained sand, subrounded to subangular, some lime, low plasticity, brown
5					GM		Man-made FILL SILTY SAND, GRAVEL & COBBLES, trace to some boulders, predominantly coarse grained subrounded gravel, medium to coarse grained subangular to subrounded sand, trace of lime, low plasticity to nonplastic, light yellowish brown note: PID reading of spoil pile = 1.8 ppm
15							Stopped Backhoe at 13'
20							
25							

- SAMPLE TYPE
- B - Undisturbed Block Sample.
 - D - Disturbed Bulk Sample.
 - J - Jar Sample
 - G - Grab Sample



SHB AGRA, INC. A-35
 ENGINEERING & ENVIRONMENTAL SERVICES
 PHOENIX - TUCSON - ALBUQUERQUE
 RENO/SPARKS - EL PASO - MEXICO
 SALT LAKE CITY - LAKEWOOD/DENVER



SHB AGRA, INC.
Engineering & Environmental Services



Photo 1. Silty sand, gravel and cobbles excavated from THB-14. Minor components include construction debris.



Photo 2. Clayey sand and gravel excavated from THB-12.



Photo 3. Silty sand and gravel excavated from THB-11.
Note concrete rubble upper left and lower right portions of the photo.



Photo 4. Sand, gravel and cobbles excavated from THB-10.



Photo 5. Silty gravel and concrete excavated from THB-9.



Photo 6. Construction debris and silty sand and gravel excavated from THB-7.



Photo 7. Test Pit THB-6.
Note considerable reinforcing
rods, cable and concrete.



Photo 8. Silty sand and gravel excavated from THB-5.
Note large concrete block in the foreground.



Photo 9. Silty sand and gravel with construction debris excavated from THB-2.



Photo 10. Test pit THB-2. Note considerable concrete and assorted construction debris.



Photo 11. Construction debris and rubbish with sand, gravel and cobbles excavated from THB-1. Note considerable amount of wood and organic material.



SHB AGRA, INC.
Engineering & Environmental Services



EXCAVATE

MAN-MADE FILL QUANTITY ESTIMATE

CALCULATION SHEET

QUANTITY ESTIMATE -- ALTERNATIVE NO. 1

INVESTIGATION OF THE CONCEPTUAL

ALIGNMENT FOR 100-YEAR 215,000 CFS

SOUTH BANK PROTECTION McCLINTOCK

DRIVE 3600 FEET EAST

SHB JOB NO. E87-56

LETTER NO. 1119

CROSS-SECTION LOCATION		PLANIMETER AREA (sq feet)	DISTANCE TO NEXT SECTION (feet)	ESTIMATED VOLUME (cubic yd)
CONTROL LINE	STATION			
215,000 CFS	649-000	1,276		
			400	17,156
215,000 CFS	649-400	1,040	200	14,415
215,000 CFS	649-600	2,852	300	29,556
215,000 CFS	649-900	2,468	200	39,067
215,000 CFS	649-1100	8,080	260	79,156
215,000 CFS	620-100	8,360	200	69,926
215,000 CFS	620-300	10,520	200	59,259
215,000 CFS	620-500	5,480	150	39,222
215,000 CFS	621-200	8,640	200	64,000
215,000 CFS	621-400	8,640	200	53,778
215,000 CFS	621-600	5,880	215	43,159
215,000 CFS	621-808	4,960		
			TOTAL	509,000



LANDFILL CAP QUANTITY ESTIMATE

CALCULATION SHEET
QUANTITY ESTIMATE -- ALTERNATIVE NO. 1
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119

CROSS-SECTION LOCATION		CROSS-SECTIONAL LENGTH (feet)	DISTANCE TO NEXT SECTION (feet)	ESTIMATED AREA (square yd)
CONTROL LINE	STATION			
215,000 CFS	649-000	25	400	1,111
215,000 CFS	649-400	25	200	533
215,000 CFS	649-600	23	300	1,017
215,000 CFS	649-900	38	200	867
215,000 CFS	649-1100	40	260	1,676
215,000 CFS	620-100	76	200	1,633
215,000 CFS	620-300	71	200	1,722
215,000 CFS	620-500	84	150	967
215,000 CFS	621-200	32	200	1,356
215,000 CFS	621-400	90	200	1,889
215,000 CFS	621-600	80	215	1,911
215,000 CFS	621-808	80		
			TOTAL	14,700



EXCAVATE

MAN-MADE FILL QUANTITY ESTIMATE

CALCULATION SHEET

QUANTITY ESTIMATE -- ALTERNATIVE NO. 2

INVESTIGATION OF THE CONCEPTUAL

ALIGNMENT FOR 100-YEAR 215,000 CFS

SOUTH BANK PROTECTION McCLINTOCK

DRIVE 3600 FEET EAST

SHB JOB NO. E87-56

LETTER NO. 1119

CROSS-SECTION LOCATION		PLANIMETER AREA (sq feet)	DISTANCE TO NEXT SECTION (feet)	ESTIMATED VOLUME (cubic yd)
CONTROL LINE	STATION			
215,000 CFS	649-000	1,276	400	17,156
215,000 CFS	649-400	1,040	200	6,704
215,000 CFS	649-600	770	300	14,722
215,000 CFS	649-900	1,880	200	12,000
215,000 CFS	649-1100	1,360	260	35,726
215,000 CFS	620-100	6,060	200	47,148
215,000 CFS	620-300	6,670	200	55,593
215,000 CFS	620-500	8,340	150	37,278
215,000 CFS	621-200	5,080	200	39,926
215,000 CFS	621-400	5,700	200	33,778
215,000 CFS	621-600	3,420	215	25,083
215,000 CFS	621-808	2,880		
			TOTAL	325,000



LANDFILL CAP QUANTITY ESTIMATE

CALCULATION SHEET
QUANTITY ESTIMATE -- ALTERNATIVE NO. 2
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119

CROSS-SECTION LOCATION		CROSS-SECTIONAL LENGTH (feet)	DISTANCE TO NEXT SECTION (feet)	ESTIMATED AREA (square yd)
CONTROL LINE	STATION			
215,000 CFS	649-000	24	400	1,067
215,000 CFS	649-400	24	200	800
215,000 CFS	649-600	48	300	1,567
215,000 CFS	649-900	46	200	989
215,000 CFS	649-1100	43	260	1,676
215,000 CFS	620-100	73	200	1,622
215,000 CFS	620-300	73	200	1,822
215,000 CFS	620-500	91	150	1,075
215,000 CFS	621-200	38	200	1,267
215,000 CFS	621-400	76	200	1,689
215,000 CFS	621-600	76	215	1,863
215,000 CFS	621-808	80		
			TOTAL	15,400



EXCAVATES

MAN-MADE FILL QUANTITY ESTIMATE

CALCULATION SHEET
QUANTITY ESTIMATE -- ALTERNATIVE NO. 3
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119

CROSS-SECTION LOCATION		PLANIMETER AREA (sq feet)	DISTANCE TO NEXT SECTION (feet)	ESTIMATED VOLUME (cubic yd)
CONTROL LINE	STATION			
215,000 CFS	649-000	1,276	400	17,985
215,000 CFS	649-400	1,152	200	8,148
215,000 CFS	649-600	1,048	300	17,156
215,000 CFS	649-900	2,040	200	13,704
215,000 CFS	649-1100	1,660	260	32,500
215,000 CFS	620-100	5,090	200	39,185
215,000 CFS	620-300	5,490	200	44,778
215,000 CFS	620-500	6,600	150	31,222
215,000 CFS	621-200	4,640	200	38,296
215,000 CFS	621-400	5,700	200	33,778
215,000 CFS	621-600	3,420	215	25,083
215,000 CFS	621-808	2,880		
			TOTAL	302,000



SOIL NAIL WALL QUANTITY ESTIMATE

CALCULATION SHEET
QUANTITY ESTIMATE -- ALTERNATE NO. 3
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119

<u>CROSS-SECTION LOCATION</u>		SUPPORTED HEIGHT (feet)	DISTANCE TO NEXT SECTION (feet)	ESTIMATED AREA (square ft)
CONTROL LINE	STATION			
215,000 CFS	649-000	9	400	3,600
215,000 CFS	649-400	9	200	1,400
215,000 CFS	649-600	5	300	3,300
215,000 CFS	649-900	17	200	3,300
215,000 CFS	649-1100	16	260	6,500
215,000 CFS	620-100	34	200	7,200
215,000 CFS	620-300	38	200	8,000
215,000 CFS	620-500	42	260	8,190
215,000 CFS	621-310	21		
			TOTAL	41,500



LANDFILL CAP QUANTITY ESTIMATE

CALCULATION SHEET
QUANTITY ESTIMATE -- ALTERNATIVE NO. 3
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119

CROSS-SECTION LOCATION		CROSS-SECTIONAL LENGTH (feet)	DISTANCE TO NEXT SECTION (feet)	ESTIMATED AREA (square yd)
CONTROL LINE	STATION			
215,000 CFS	621-310	70		
			90	730
215,000 CFS	621-400	76		
			200	1,689
215,000 CFS	621-600	76		
			215	1,863
215,000 CFS	621-808	80		
			TOTAL	4,300



SHB AGRA, INC.
Engineering & Environmental Services



PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 1

INVESTIGATION OF THE CONCEPTUAL

ALIGNMENT FOR 100-YEAR 215,000 CFS

SOUTH BANK PROTECTION McCLINTOCK

DRIVE 3600 FEET EAST

SHB JOB NO. E87-56

LETTER NO. 1119

ITEM	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
EXCAVATION				
MAN-MADE FILL	CY	509,000	\$ 5.00 *	\$ 2,545,000.00
NATIVE MATERIAL	CY	40,000	2.00 *	80,000.00
TRANSPORTATION & DISPOSAL				
MSW (1.15 TONS/CY)	TON	88,000	29.00 *	2,552,000.00
RUBBISH (1.15 TONS/CY)	TON	88,000	25.00 *	2,200,000.00
PLACEMENT OF REUSABLE MATERIAL	CY	356,000 @	0.50	178,000.00
COMPACTED CLAY CAP	SY	14,700	10.00	147,000.00
CEMENT STABILIZED ALLUVIUM				
AVG. HEIGHT x 8' THICK x 3600 FEET	CY	50,000 #	25.00 #	1,250,000.00
SUBTOTAL				\$ 8,952,000.00
MOBILIZATION * 6%				716,160.00
SUBTOTAL				\$ 9,668,160.00
CONSTRUCTION ADMINISTRATION (15%)				1,450,200.00
SUBTOTAL				\$ 11,118,360.00
INCIDENTIAL TO CONSTRUCTION (15%)				1,667,800.00
TOTAL CONSTRUCTION				\$ 12,786,160.00

NOTE: * ESTIMATED COST BASED ON AVERAGE OF BIDS FOR ADOT PROJECT RAM 600-5-507.
 @ COST ESTIMATE DOES NOT INCLUDE THE PLACEMENT OF FILL MATERIAL BEHIND THE BANK PROTECTION LEVEE.
 # QUANTITY AND COST ESTIMATE FOR CSA PROVIDED BY DMJM.



PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 1
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119

PRELIMINARY ESTIMATE SUMMARY

GEOTECHNICAL INVESTIGATION	\$	<u>250,000.00</u>
RIGHT-OF-WAY		300,000.00
DESIGN		250,000.00
CONSTRUCTION (see above detail)		<u>12,786,160.00</u>
GRAND TOTAL	\$	13,586,160.00

Why so high
4 13,336,160.00

*See SHB ltr
7/23/93*

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET
 COST ESTIMATE -- ALTERNATIVE NO. 2
 INVESTIGATION OF THE CONCEPTUAL
 ALIGNMENT FOR 100-YEAR 215,000 CFS
 SOUTH BANK PROTECTION McCLINTOCK
 DRIVE 3600 FEET EAST
 SHB JOB NO. E87-56
 LETTER NO. 1119

ITEM	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
EXCAVATION				
MAN-MADE FILL	CY	325,000	\$ 5.00 *	\$ 1,625,000.00
NATIVE MATERIAL	CY	40,000	2.00 *	80,000.00
TRANSPORTATION & DISPOSAL				
MSW (1.15 TONS/CY)	TON	56,000	29.00 *	1,624,000.00
RUBBISH (1.15 TONS/CY)	TON	56,000	25.00 *	1,400,000.00
PLACEMENT OF REUSABLE MATERIAL	CY	228,000 @	0.50	114,000.00
COMPACTED CLAY CAP	SY	15,400	10.00	154,000.00
CEMENT STABILIZED ALLUVIUM				
AVG. HEIGHT x 8' THICK x 3600 FEET	CY	50,000 #	25.00 #	<u>1,250,000.00</u>
SUBTOTAL				\$ 6,247,000.00
MOBILIZATION *				<u>499,760.00</u>
SUBTOTAL				\$ 6,746,760.00
CONSTRUCTION ADMINISTRATION (15%)				<u>1,012,000.00</u>
SUBTOTAL				\$ 7,758,760.00
INCIDENTIAL TO CONSTRUCTION (15%)				<u>1,163,800.00</u>
TOTAL CONSTRUCTION				\$ 8,922,560.00

NOTE: * ESTIMATED COST BASED ON AVERAGE OF BIDS FOR ADOT PROJECT RAM 600-5-507.
 @ COST ESTIMATE DOES NOT INCLUDE THE PLACEMENT OF FILL MATERIAL BEHIND THE BANK PROTECTION LEVEE.
 # QUANTITY AND COST ESTIMATE FOR CSA PROVIDED BY DMJM.



PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 2
INVESTIGATION OF THE CONCEPTUAL
ALIGNMENT FOR 100-YEAR 215,000 CFS
SOUTH BANK PROTECTION McCLINTOCK
DRIVE 3600 FEET EAST
SHB JOB NO. E87-56
LETTER NO. 1119

PRELIMINARY ESTIMATE SUMMARY

GEOTECHNICAL INVESTIGATION	\$	250,000.00
RIGHT-OF-WAY		300,000.00
DESIGN		250,000.00
CONSTRUCTION (see above detail)		<u>8,922,560.00</u>
GRAND TOTAL	\$	9,722,560.00

~~9,100,000~~

\$ 9,472,560.00

See SHB/Hr
7/23/83

PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET
 COST ESTIMATE -- ALTERNATIVE NO. 3
 INVESTIGATION OF THE CONCEPTUAL
 ALIGNMENT FOR 100-YEAR 215,000 CFS
 SOUTH BANK PROTECTION McCLINTOCK
 DRIVE 3600 FEET EAST
 SHB JOB NO. E87-56
 LETTER NO. 1119

ITEM	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
EXCAVATION				
MAN-MADE FILL	CY	302,000	\$ 5.00 *	\$ 1,510,000.00
NATIVE MATERIAL	CY	40,000	2.00 *	80,000.00
TRANSPORTATION & DISPOSAL				
MSW (1.15 TONS/CY)	TON	52,000	29.00 *	1,508,000.00
RUBBISH (1.15 TONS/CY)	TON	52,000	25.00 *	1,300,000.00
PLACEMENT OF REUSABLE MATERIAL	CY	211,000 @	0.50	105,500.00
COMPACTED CLAY CAP	SY	4,300	10.00	43,000.00
CEMENT STABILIZED ALLUVIUM				
AVG. HEIGHT x 8' THICK x 3600 FEET	CY	50,000 #	25.00 #	1,250,000.00
TEMPORARY SOIL NAIL WALL	SF	41,500	30.00	1,245,000.00
SUBTOTAL			7041.5	\$ 5,796,500.00
MOBILIZATION * 8%			563.3	463,720.00
SUBTOTAL			7604.82	\$ 6,260,220.00
CONSTRUCTION ADMINISTRATION (15%)			1140.72	939,000.00
SUBTOTAL			8745.54	\$ 7,199,220.00
INCIDENTIAL TO CONSTRUCTION (15%)			1311.83	1,079,900.00
TOTAL CONSTRUCTION			10,057,370	\$ 8,279,120.00

NOTE: * ESTIMATED COST BASED ON AVERAGE OF BIDS FOR ADOT PROJECT RAM 600-5-507.
 @ COST ESTIMATE DOES NOT INCLUDE THE PLACEMENT OF FILL MATERIAL BEHIND THE BANK PROTECTION LEVEE.
 # QUANTITY AND COST ESTIMATE FOR CSA PROVIDED BY DMJM.



PRELIMINARY CONSTRUCTION COST ESTIMATE

CALCULATION SHEET

COST ESTIMATE -- ALTERNATIVE NO. 3

INVESTIGATION OF THE CONCEPTUAL

ALIGNMENT FOR 100-YEAR 215,000 CFS

SOUTH BANK PROTECTION McCLINTOCK

DRIVE 3600 FEET EAST

SHB JOB NO. E87-56

LETTER NO. 1119

PRELIMINARY ESTIMATE SUMMARY

GEOTECHNICAL INVESTIGATION

RIGHT-OF-WAY

DESIGN

CONSTRUCTION (see above detail)

GRAND TOTAL

\$ 250,000.00

300,000.00

250,000.00

8,279,120.00

10,057,70

9,10,857,370

9,079,120.00

<1,778K>

(10,200,000)

10,607,320.00

See SHB ltr

2/23/53

Maybe 100K
(why so high?)

FACSIMILE
COVER SHEET

DMJM

DANIEL, MANN, JOHNSON, & MENDENHALL
300 WEST CLARENDON, SUITE 400
PHOENIX, ARIZONA 85013-3499
PHONE: (602) 277-1074
FAX: (602) 241-0721

PLEASE CALL IF PROBLEMS OCCUR OR RECIPIENT'S
CONFIRMATION IS REQUIRED.

DATE OF
TRANSMITTAL: 3/25/94

CHARGE NUMBER: _____

RECIPIENT'S FAX NUMBER: 506-4601

ATTENTION: Richard Perreault

FROM: Judy Lyles

WE ARE SENDING 2 PAGE(S).

MESSAGE:

*This table is information you requested
from Terry Bourland (ADOT-SPM). If
you have any questions or require
additional information, please call me
at 277-1074.*

Thanks,

Judy

BID TABULATIONS
202L MA 8 H 2151 04C RAM-600-5-507
EAST PAPAGO (Indian Bend Wash - Jct. 101L)

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	EXTENDED AMOUNT
2020001	Rem. of Structures & Obstructions				
	ADOT	L.Sum	1	\$40,000.00	\$40,000.00
	SUNDT			\$225,000.00	\$225,000.00
2030201	Excavation (SRP-75, -78)				
	ADOT	Cu.Yd.	128,600	\$20.00	\$2,572,000.00
	SUNDT			\$16.40	\$2,109,040.00
2030202	Excavation (OTL)				
	ADOT	Cu.Yd.	430,800	\$4.00	\$1,723,200.00
	SUNDT			\$2.50	\$1,077,000.00
2070001	Dust Palliative				
	ADOT	M.Gal.	9,400	\$8.00	\$75,200.00
	SUNDT			\$8.00	\$75,200.00
2080001	Separation Geotextile Fabric				
	ADOT	Sq.Yd.	50,000	\$1.50	\$75,000.00
	SUNDT			\$2.25	\$112,500.00
5011075	Pipe, Rein. Conc. Class V, 72"				
	ADOT	L.Ft.	264	\$300.00	\$79,200.00
	SUNDT			\$250.00	\$66,000.00
7010001	Maint. & Protection of Traffic				
	ADOT	L.Sum.	1	\$50,000.00	\$50,000.00
	SUNDT			\$50,000.00	\$50,000.00
7010006	Furn. & Install Temp Traff. Cont. Dev.				
	ADOT	L.Sum	1	\$10,000.00	\$10,000.00
	SUNDT			\$20,000.00	\$20,000.00
9010001	Mobilization				
	ADOT	L.Sum	1	\$500,000.00	\$500,000.00
	SUNDT			\$400,000.00	\$400,000.00
9240010	Force Acct. (Break up Concrete)				
	ADOT	L.Sum	1	\$10,000.00	\$10,000.00
	SUNDT			\$10,000.00	\$10,000.00
9240011	Force Acct. (Isolation Areas)				
	ADOT	L.Sum	1	\$45,000.00	\$45,000.00
	SUNDT			\$45,000.00	\$45,000.00
9240121	Misc. Work (Decontamination Sites)				
	ADOT	Ea.	3	\$15,000.00	\$45,000.00
	SUNDT			\$25,000.00	\$75,000.00
9240140	Misc. Work (Off Site Hauls, MSW, OTL)				
	ADOT	Ton	21,500	\$22.00	\$473,000.00
	SUNDT			\$20.00	\$430,000.00
9240141	Misc. Work (Off Site Hauls, RBH, OTL)				
	ADOT	Ton	4,400	\$12.25	\$53,900.00
	SUNDT			\$17.00	\$74,800.00
9240170	Contractor Quality Control				
	ADOT	L.Sum	1	\$40,000.00	\$40,000.00
	SUNDT			\$35,000.00	\$35,000.00
9250001	Construction Surveying & Layout				
	ADOT	L.Sum	1	\$50,000.00	\$50,000.00
	SUNDT			\$30,000.00	\$30,000.00
9260004	Engineers Field Office				
	ADOT	L.Sum	1	\$15,000.00	\$15,000.00
	SUNDT			\$27,000.00	\$27,000.00

SMB
EST.

\$5.00

\$29.00

\$25.00

ADOT \$5,858,500.00
 SUNDT \$4,861,540.00



Daniel, Mann, Johnson, & Mendenhall
 300 West Clarendon Avenue, Suite 400
 Phoenix, Arizona 85013-3499
 Telephone: 602/264-1397, 602/264-0217
 Fax: 602/285-1984

Planning
 Architecture
 Engineering
 Landscape
 Architecture

letter of transmittal

To: Flood Control District
2801 W. Durango
Phoenix, AZ 85009

Document No. 35672

Date: 5/25/93	Project No.
Project: 202L MA H 0858 01D	
143 MA H 0843 01D	
153 MA H 0880 01D	
East Papago/Hohokam/Sky Harbor	

Attn. Dick Perreault

File No. 300.11, 500.6.5, 800

We transmit:
 herewith () under separate cover via _____
 () in accordance with your request

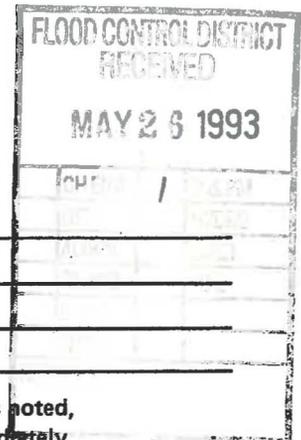
For your:
 () approval () distribution to parties (x) information
 () review & comment () record
 use () _____

The following:
 () prints () copy of letter () change order
 () originals () specifications () calculations
 () shop drawings () _____

Copies	Dwg. No.	Description	Action Code
1		Corrected version of Site Plan from SHB Letter No. 1119	

Action Code A. Reviewed B. Reviewed as noted C. Revise & resubmit D. See remarks below

Remarks: _____



If enclosures are not as noted, please inform us immediately.

Copies to: Steve Jimenez - ADOT

Signed: Thomas Monchak
 Thomas M. Monchak
 Project Manager



ARIZONA DEPARTMENT OF TRANSPORTATION



HIGHWAY DIVISION

206 South Seventeenth Avenue - Phoenix, Arizona 85007-3213

FIFE SYMINGTON
Governor

LARRY S. BONINE
Director

GARY K. ROBINSON
State Engineer

June 3, 1993

FLOOD CONTROL DISTRICT RECEIVED	
JUN 08 1993	
CHENG	F & PM
DEP	IMDRO
ADMIN	LMGT
FINANCE	FILE
G & C	
INS	
RECORDS	

6/14
 Mr. Richard G. Perreault, Chief
 Planning Branch
 Flood Control District of Maricopa County
 2801 West Durango
 Phoenix, Arizona 85009

RE: Investigation of the Conceptual Alignment for 100-Year South Bank Protection from McClintock Dr. to approx. 3,600 Feet East

Dear Dick:

Attached is the corrected Site Plan to be included in the interim report sent to you on May 14, 1993.

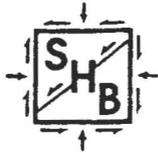
If you have any questions please contact me at 255-7545.

Sincerely,

Terry L. Bourland
Project Manager
Statewide Project Management

cc: Howard Hargis, City of Tempe
Tom Monchak, DMJM

Dick:
 I have attached the exhibits you requested. If you require additional copies please call. *TS*



SHB AGRA, INC.
Engineering & Environmental Services

3232 West Virginia Avenue
Phoenix, Arizona 85009
Phone: 602-272-6848
Fax: 602-272-7239

TRANSMITTAL

TO: Arizona Department of **Date:** May 24, 1993
Transportation **Project:** East Papago
205 South 17th Ave - Rm 216E **Job/Proposal No.** E87-56
Phoenix, Arizona 85007 **Transmittal No.** Letter No. 1145
ATTN: Steven A. Jimenez, P.E. **Reference** _____

We are:	For your:	The following:
<input checked="" type="checkbox"/> transmitting	<input type="checkbox"/> review & comment	<input type="checkbox"/> boring logs
<input type="checkbox"/> returning	<input checked="" type="checkbox"/> information/files	<input type="checkbox"/> calculations
<input type="checkbox"/> separately	<input type="checkbox"/> approval	<input type="checkbox"/> design charts
	<input type="checkbox"/> signature	<input type="checkbox"/> progress reports
	<input type="checkbox"/> as requested	<input type="checkbox"/> laboratory results
		<input checked="" type="checkbox"/> plans
		<input type="checkbox"/> specifications
		<input type="checkbox"/> other: _____

Copies	Date	Description
4	5/24/93	Corrected version of Site Plan from Letter No. 1119

Delivery by:

Hand Delivery Express Mail Return Receipt Requested
 First Class Mail Courier Service
 Registered Mail Other: _____

Remarks:

RECEIVED
MAY 24 1993
STATE PROJECT
MANAGEMENT

Copy to: Addressee (4) By: Charles E. Reynolds
File Charles E. Reynolds
City of Tempe - Howard Hargis, P.E. (1)
Maricopa County Flood Control District -
Mr. ~~Don Perreault~~ (1)
Dick Perreault



McCLINTOCK DRIVE

N 885,000

N 885,000

E 503,000

PARCEL 7-6336

PARCEL 7-6336

PARCEL 7-6341

PARCEL 7-6614

PARCEL 7-6615

PARCEL 7-6616

PARCEL 7-6335

PARCEL 7-6617

Current ADOT Right-of-Way

Estimated Maximum Limit of Excavation for Removal of Man-Made Fills for Construction of the Proposed 100-Year 215,000cfs Bank Protection System.

Estimated Area of Man-Made Fills Removed as part of ADOT Project RAM-600-5-507

Approximate Crest of Man-Made Fill Deposits

Proposed Alignment of 100-Year 215,000cfs Bank Protection System

Current ADOT Right-of-Way

PERRY LANE LANDFILL

INACTIVE CONSTRUCTION DEBRIS LANDFILL

OLD TEMPE LANDFILL

LEGEND

SPECIAL SYMBOLS

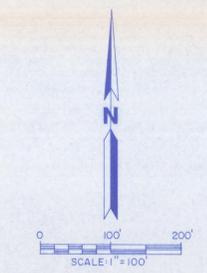
- ⊕ CURRENT HARBANK INVESTIGATION BORING LOCATION
- ⊕ CURRENT HARBANK INVESTIGATION TEST PIT LOCATION
- ▲ CURRENT HARBANK INVESTIGATION SHALLOW SOIL GAS TEST LOCATION
- ⊕ PREVIOUS INVESTIGATION BORING LOCATION
- ⊕ PREVIOUS INVESTIGATION TEST PIT LOCATION

SPECIAL ABBREVIATIONS

- HB- TEST BORING
- THB- TEST PIT
- SGA- SHALLOW SOIL GAS
- BH- } PREVIOUS INVESTIGATION TEST BORING
- BHA- }
- BHB- }
- BHC- }
- TP- } PREVIOUS INVESTIGATION TEST PIT
- TPA- }
- TPC- }
- WMW- WATER MONITOR WELL INSTALLED DURING PREVIOUS INVESTIGATION
- GMW- GAS MONITOR WELL INSTALLED DURING PREVIOUS INVESTIGATION

- PROPERTY BOUNDARY
- ADOT RIGHT-OF-WAY
- APPROXIMATE CREST OF MAN-MADE FILLS
- PROPOSED ALIGNMENT OF 100-YEAR 215,000CFS BANK PROTECTION SYSTEM
- ESTIMATED MAXIMUM LIMIT OF MAN-MADE FILL REMOVAL
- 621.808 QUANTITY CALCULATION CROSS-SECTION LOCATION

NOTE: BASE MAP PREPARED WITH INFORMATION PROVIDED BY SIMONS L I & ASSOCIATES, GMTS CONSULTING ENGINEERS AND THE ARIZONA DEPARTMENT OF TRANSPORTATION.



FLOOD CONTROL DISTRICT RECEIVED	
MAY 26 1993	
CHENG	P & PM
SEP	HYDRO
ACORN	LAND
FRANCK	FILE
C.O.	
REMARKS	

CORRECTIONS AND ADDITION OF INFORMATION		5/24/93			
REVISIONS					
<p align="center">SITE PLAN SHOWING SAMPLING LOCATIONS INVESTIGATION OF CONCEPTUAL ALIGNMENT OF 100-YEAR 215,000 CFS HARBANK</p>					
EAST PAPAGO - HOHOKAM - SKY HARBOR FREEWAYS - TEMPE ARIZONA					
JOB No.	DATE	DESIGNED BY	DRAWN BY	CHECK BY	SHEET No.
ES7-56	4/93	CER	TMP	NJL	1