Appendix E

Sediment Characterization and Potential Use Assessment Report

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TETRA TECH

Project No. BAS 11-58E
October 6, 2011

Daniel B. Sharp, P.E.
County of Los Angeles Department of Public Works
Watershed Management Division
900 South Fremont Avenue
Alhambra, California 91803

Subject: **REPORT FOR SEDIMENTATION STUDY**
SEDIMENTATION CHARACTERIZATION AND POTENTIAL USE ASSESSEMENT
Los Angeles, California
Project No. BAS 11-58E

Dear Mr. Sharp:

The purpose of this report is to summarize the results of our Sediment Characterization and Potential Use Assessment phases of the work plan outlined in our Proposal for Development of Sediment Pilot Study Work Plan dated May 2, 2011, and to provide justified recommendations for the field pilot study.

We appreciate the opportunity to provide our professional services on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact us.

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EXECUTIVE SUMMARY

The results of our investigation indicate that materials accumulating in debris basins and reservoirs have value and may be processed into useful construction materials to broadly include:

- Coarse Aggregate
- Washed Concrete Sand
- Aggregate Base
- Fill Sand
- Top Soil

The net value of materials, considering processing costs but no handling at the source or transportation, is estimated at about $1 per ton for average materials derived from debris basins or reservoirs. Pending haul rates and distances, the net value of these materials may easily be eroded by the cost of hauling materials to a production plant. However, transportation costs are unavoidable when excavating out a debris basin or reservoir, whether the excavated materials are transported to a Sediment Placement Site (SPS) for disposal or to a production plant for processing to useful materials. Any gains achievable from producing construction materials would offset costs associated with cleaning out debris basins or reservoirs. The indirect value of diverting waste from SPS's and extending the service life of these facilities should also be taken into consideration.

A pilot plant is recommended and will provide insight into plant logistics, processes, marketing and distribution. Due to the expense of a wet process required for washed concrete sand, the pilot plant is recommended to be conducted in two mobilizations: a dry process and a wet process. The data collected during a pilot plant operation will be directly applicable to processing of any earth material. The costs of the pilot test are anticipated to be significantly offset by the value of the material produced.

SEDIMENT CHARACTERIZATION

Sediment Characterization Program

Our sediment characterization consisted of test pit and hand-auger explorations performed at the May SPS, Devil's Gate Reservoir and Santa Fe Dam. The locations of these sites within the greater Los Angeles area are shown on the attached Figure 1. The locations of the explorations are shown on the attached Figures 2 through 4 and are summarized in the following table.

Site	Date of Explorations	Type of Exploration	Number of Explorations	Depth of Exploration
May SPS	June 1, 2011	Test Pit	4	10 to 12 feet
Devil's Gate	June 9, 2011	Hand Auger	12	2 to 8 feet
Santa Fe Dam	June 14, 2011	Hand Auger	5	2 to 3 feet

The study sites where chosen based on accessibility and representation of different depositional environments. The materials encountered at the sites are considered representative of the following environments:

- May SPS materials are generally representative of debris basin sediments after the Station Fire of July through November 2009.
- Devil's Gate materials are generally representative of materials accumulating in a reservoir.
- Santa Fe materials are generally representative of materials placed by a sluicing operation.

An environment which may not be represented are debris basins within steep valleys incised into the surrounding mountains such as the debris basin shown in the photograph on the cover of this report where rock falls, rolling sediments, or debris flows with abundant cobbles and boulders are prevalent.

Sampling with a 4-inch diameter hand auger as was the case with the Devil's Gate explorations precludes sampling cobbles or boulders. Cobbles and boulders were observed at some locations within Devil's Gate reservoir and in some cases were encountered as refusal in the exploration. Therefore, some bias toward finer materials is expected in the sampling results. A hand auger was also used for the Santa Fe Dam explorations. However, minimal bias due to sampling is anticipated at this location because of the character of the material. The sluiced material sampled at the top of the existing Santa Fe Dam stockpile consists of sand that is relatively clean of oversized materials. This material is typical of pumped hydraulic fills as evidenced by few cobbles observed at the surface. The May SPS explorations were performed with a large bucket hydraulic excavator. The resultant stockpiled spoils were sampled with a shovel at the top third, mid third and bottom third of the stockpile in general accordance with ASTM D75. The May SPS materials are anticipated to have minimum bias due to sampling.

Laboratory tests were performed to evaluate the quality of the materials encountered and included the following.

- 26 particle size gradation tests (ASTM D6913)
- 6 plasticity index tests (ASTM D4318)
- 5 sand equivalent tests (ASTM D2419)
- 7 organic impurities tests (ASTM C40)
- 4 organic content tests (ASTM D2974)
- 4 sodium sulfate soundness tests (ASTM C88)

The results of all laboratory tests are included in Appendix A. The particle size gradations are summarized graphically with respect to the material specifications described in the following section on the attached Figures 5, 6, and 7 for the May SPS, Devil's Gate Reservoir, and Santa Fe Dam, respectively. The results of the other material quality tests are summarized in the following table.

Site	Test				
	Plasticity Index	**Sand Equivalent(1)**	**Organic Impurities(2)**	**Organic Content(2)**	**Sodium Sulfate Soundness(1)**
SPS May	Not Tested	25 to 27%	Darker than Standard	2.5 to 4.4%	5% loss
Devil's Gate	Non-Plastic to 12	74 to 89%	Standard to Darker than Standard	4.6% to 11.9%	1% to 2% loss
Santa Fe Dam	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested
Typical Limits	- 6 maximum for aggregate base and sub-base - 4 maximum for asphalt sand	- 30% or better typical for fill sand - 50% or better typical for aggregate base	- Darker than Standard(3) rejected for concrete aggregates	- Less than 5% for unclassified fill; - 2 to 20% ideal for top soil	- Less than10% for concrete aggregates

(1) Performed only on predominantly granular material (i.e., Soil Category B, C or D materials as described in the following table) which are potentially suitable for concrete aggregates.
(2) Performed only on materials which appeared to have a relatively high organic content.
(3) Darker than Standard refers to soil when subjected to a specified chemical reagent provides a darker color relative to when the soil is subjected to a second standard color reagent. For a more precise description, the color may be described in comparison to glass color standards and provided a value of 1 through 5, where 3 is Standard, 4 and 5 are Darker than Standard, and 1 and 2 are Lighter than Standard. A Darker than Standard color would typically be rejected, or require more investigation, according to standard concrete practice.

Organic impurities and contents were evaluated only for materials which appeared to have a relatively high organic content as evidenced by color and odor. The following photograph shows typical soil with apparent organic impurities as observed in the test pits of May SPS.

Source Materials

For the purposes of this study, the soils encountered may be categorized as shown in the following table.

Category	Quality	Soil Group Symbols(1)	Soil Group Names(1)
A	Low	*SM/ML*, *SM*	borderline *Silty Sand* to *Sandy Silt*; *Silty Sand*
B	Low to Intermediate	*SP-SM/SM*, *SW-SM/SM*, *SM*	borderline *Poorly Graded Sand with Silt* to *Silty Sand*; borderline *Well Graded Sand with Silt* to *Silty Sand*; *Silty Sand*
C	Intermediate to High	*SP, SW, SP-SM, SW-SM*	*Poorly Graded Sand*; *Well Graded Sand*; *Poorly Graded Sand with Silt*; *Poorly Graded Sand with Silt and Gravel*; *Well Graded Sand with Silt*; *Well Graded Sand with Silt and Gravel*
D	High	*GP, GW, GP-GM, GW-GM, GM*	*Poorly Graded Gravel*; *Well Graded Gravel*; *Poorly Graded Gravel with Silt*; *Poorly Graded Gravel with Silt and Sand*; *Well Graded Gravel with Silt*; *Well Graded Gravel with Silt and Sand*; *Silty Gravel*

(1) ASTM D2488, Description and Identification of Soils, using borderline cases described in Appendix X3 of the referenced standard.

The relative occurrences of the soil categories described above are summarized in the following table for the May SPS, Devil's Gate Reservoir, and Santa Fe Dam. The approximate near surface distribution of soil categories are shown in plan view on the attached Figures 2, 3, and 4 for the May SPS, Devil's Gate Reservoir and Santa Fe Dam, respectively.

Site	Category A (%)	Category B (%)	Category C (%)	Category D (%)
May SPS	0	100	0	0
Devil's Gate Reservoir	48	23	29	0
Santa Fe Dam	63	37	0	0
Average	**37**	**53**	**10**	**0**

The soil categories described above exclude cohesive clays, and the Category D gravel was not encountered in our explorations. That is, the materials encountered generally appear to consist of silt, sand and lesser amounts of gravel, particles that may be eroded and transported by moderate flow velocities, and tend to exclude cohesive clay and heavy gravel which are expected to be erodible only at higher flow velocities as predicted by the Hjulström diagram (Sundborg, 1956). Although not encountered at our exploration locations and not expected to be typical of most debris basins or reservoirs, Category D materials are expected in some areas. For example,

Category D materials may be found in limited quantities at the headwaters of reservoirs where high flow velocities occur. They may also be found in debris basins within steep valleys incised into the surrounding mountains where rock falls, rolling sediments and debris flows with abundant cobbles and boulders are prevalent.

POTENTIAL USE ASSESSMENT

Product Values

For the purposes of this study, construction materials that may be derived from debris basins or reservoirs are categorized as shown in the following table.

Category	Nationally Recognized Standard	Applicable Local Product Names	Processing	Estimated Value
Top Soil	ASTM D5268	Top Soil (without amendments) Unclassified Fill	Dry Screen	$3/ton
Fill Sand	N/A	Fill Sand Unclassified Fill	Dry Screen	$6/ton
Coarse Aggregate	ASTM C33	¾-Inch Rock Class 1 Permeable Material	Dry Screen	$15/ton
Aggregate Base	ASTM D1241	Crushed Aggregate Base Select Subbase Class 2 Permeable Material	Blend of Coarse Aggregate and Fill Sand	$13/ton
Washed Sand	ASTM C33	Concrete Sand Asphalt Sand Mortar Sand	Wash Screen	$15/ton

Fill Sand is generally used for imported structural fill and is subject to the project specific requirements. As a result, there is no nationally recognized or local standard for this material. Unclassified fill as described in Section 300-4.1 of the Standard Specifications for Public Works Construction, which beyond a restriction on oversized cobbles and boulders has few requirements, would generally fall into this category, but may also be considered Top Soil for non-structural applications.

For the purposes of this investigation, the following criteria are taken as representative of local practice for Fill Sand in most circumstances.

- Fill Sand should generally have a Sand Equivalent of 30 or greater.
- Fill Sand should generally have less than 25 percent passing the No. 200 sieve.
- Fill Sand should generally have an Expansion Index of 20 or less.

With the exception of Fill Sand, the particle size gradations specified by the referenced standards are shown with respect to the gradation of the site soils for the May SPS, Devil's Gate Reservoir and Santa Fe Dam on the attached Figures 5, 6, and 7, respectively.

The estimated values of the materials were determined by conducting a telephone survey of 6 suppliers local to the greater Los Angeles area, referencing material costs using estimating software, CostWorks® by RSMeans, for the Los Angeles area, 2011, 2nd quarter, interviewing senior level management of 1 major local supplier, and engaging a subconsultant, JMS Consulting Engineer, to review our estimated values.

Production Costs

Production costs are anticipated to vary pending, but not necessarily limited to, the following factors.

- Site access and development including entitlements, permits, flood control, storm water pollution prevention plan, and post-extraction reclamation, if any
- Equipment selection, acquisition and maintenance
- Mobilization and haul distance, if material is trucked to processing site
- Process, dry versus wet

The pilot processing plant described in the following section is intended to evaluate the costs associated with the above or similar factors. For the purposes of this study, the anticipated costs associated with producing the materials described herein are shown in the following table.

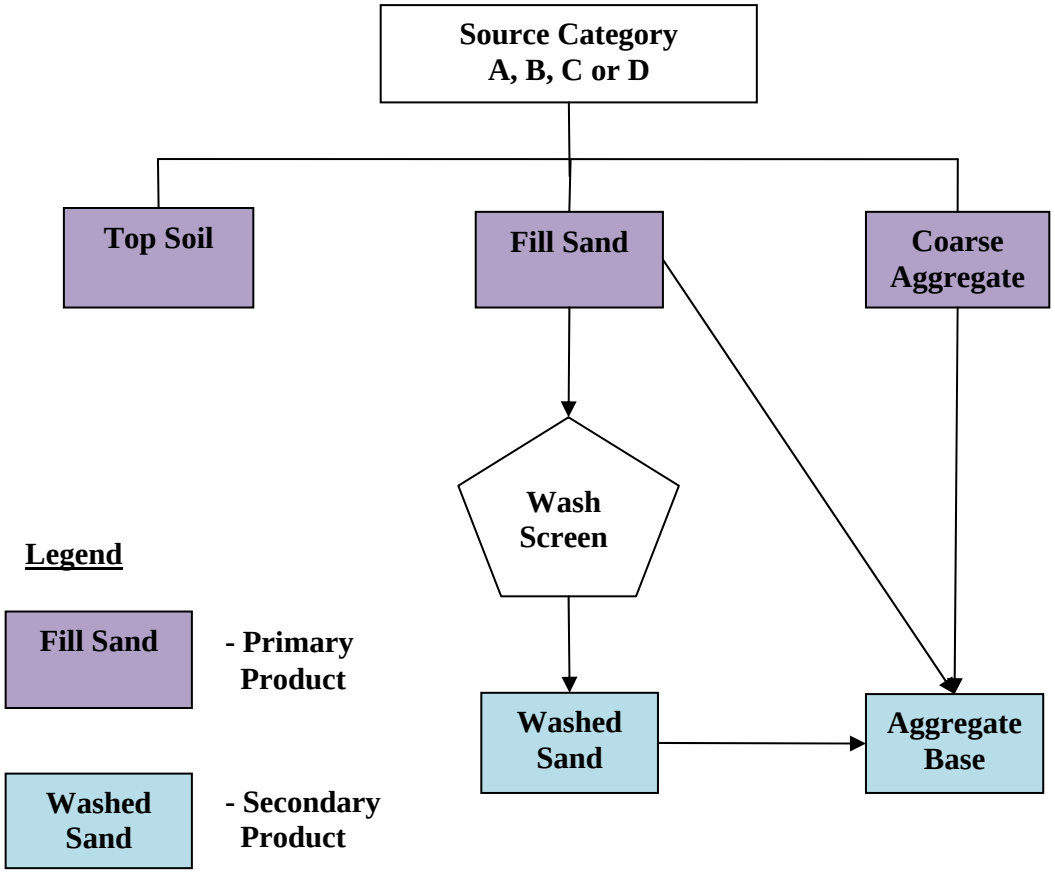
Process	Cost
Dry Screen	$4/ton
Wash Screen	$9/ton
Waste Disposal	$5/ton

Use Assessment Methodology

In general, our methodology is based on three premises: (1) source materials, provided they meet certain durability qualifications, may be grouped into broad categories based solely on gradation to include primarily silt, silt and sand mixtures, primarily sand, and primarily gravel, with material value generally increasing with coarser materials; (2) the relative proportions of primary materials used in construction that may be derived from a source category may be estimated by considering certain grain sizes, namely coarse gravel taken as coarser than ⅜ inch, fine gravel and sand taken as finer than ⅜ inch, and the least desirable fines taken as finer than the standard sized No. 200 sieve; and (3) the primary materials may be used as feeder stock to produce other secondary materials used in construction. This forms the basis for evaluation of the economic potential of a specific sediment source.

Since gradations by their nature are relative proportions of silt, sand, and gravel sized particles, it is feasible to estimate the quantities of processed construction materials that may be produced from the pilot study sites by evaluating the relative occurrences of the soil Categories A through

D previously described. The desired final products may be derived by processing the basic source categories into primary products of Top Soil, Fill Sand, and Coarse Aggregate. Secondary products may be produced by further processing or blending of primary products. For instance, Washed Sand may be derived from washing Fill Sand. Aggregate Base may be derived from blending Coarse Aggregate and Fill Sand. The flow chart below shows the derivation of secondary products from primary products.



Laboratory tests were performed for two main tasks: (1) to characterize the source materials into the 4 source categories and (2) to evaluate which products may be produced from the available sources. The following table summarized the laboratory tests performed and how the results are used to evaluate potential products from source materials.

Task	Test Description	Test Standard	Purpose and Criteria
1	Gradation	ASTM D6913	• classify source material into Category A, B, C or D material;
	Atterberg Limits	ASTM D4318	
2	Organic Impurities	ASTM C40	• if Darker than Standard, Washed Sand may not be produced as a secondary product; • if Standard, all products may be produced;
	Organic Content	ASTM D2974	• only applicable if Darker than Standard result for organic impurities; • if greater than 5 percent, only low value primary Top Soil may be produced;
	Gradation	ASTM D6913	• if greater than 70 percent passing the No. 200 sieve, the source material is not suitable for primary Top Soil and is Waste; • for a given Source Category: - percent passing the ⅜-inch sieve determines the relative proportion of primary Fill Sand produced by dry screening; - percent retained on the 1-inch sieve determines the relative proportion of material available for crushing; - the remaining material minus the above determines the relative proportion of primary Coarse Aggregate produced by dry screening. • Category C and/or D source materials are needed to produce secondary Aggregate Base; • percent passing the No. 200 sieve determines the relative proportions of secondary Washed Sand and Waste produced by wash screening of primary Fill Sand.
	Sand Equivalent	ASTM D2419	• at least 30 for higher quality Fill Sand • at least 50 for Aggregate Base
	Soundness	ASTM C88	• less than 10 percent for Coarse Aggregate and Washed Sand

For the purposes of this study, materials with apparent high organic impurities are avoided in the production of Washed Sand because Portland cement products, a common application for Washed Sand, require a low amount of organic impurities. Materials with apparent high organic impurities such as those derived from materials eroded after wild fires are recommended to be

selectively processed to produce primarily Top Soil and Fill Sand and some screened Coarse Aggregate.

When secondary products are produced, there is a commensurate reduction in the production of primary products. Our study considers the following possible production options with respect to secondary products derived from primary products. The primary products consisting of Top Soil, Fill Sand and Coarse Aggregate are produced for all the options in addition to the secondary products.

- Option 1 – No Washed Sand and no Aggregate Base is produced.
- Option 2 – All available Washed Sand is produced but no Aggregate Base is produced.
- Option 3 – All available Aggregate Base is produced but no Washed Sand is produced. Results are identical to Option 1 if no Category C or D materials are available since Fill Sand derived from Category B materials are not suitable for Aggregate Base.
- Option 4 – First, all available Washed Sand is produced. If Fill Sand remains, all available Aggregate Base is produced. Results are identical to Option 2 if no material with organic impurities is present because all Fill Sand is processed into Washed Sand.

Detailed flow charts showing the products that may be derived from the source materials were developed using the methodology described above and are shown for the May SPS, Devil's Gate Reservoir, and Santa Fe Dam on Figures 8, 9 and 10, respectively, and are summarized in the following table. These flow charts are suitable for use for any site but the percentage proportions of source material categories and material quality are specific to each site. The flow charts are intended to assist with the evaluation of available materials and selection of final products.

Material	Relative Proportions of Products											
	May SPS Figure 8				Devil's Gate Reservoir Figure 9				Santa Fe Dam Figure 10			
	Option				Option				Option			
	1	2	3	4	1	2	3	4	1	2	3	4
Top Soil	33%	33%	33%	33%	24%	24%	24%	24%	63%	63%	63%	63%
Fill Sand	62%	30%	62%	30%	70%	36%	66%	32%	34%	0%	34%	0%
Coarse Aggregate	5%	5%	5%	5%	2%	2%	0%	0%	3%	3%	3%	3%
Aggregate Base	0%	0%	0%	0%	0%	0%	6%	6%	0%	0%	0%	0%
Washed Sand	0%	25%	0%	25%	0%	27%	0%	27%	0%	24%	0%	24%
Waste Silt	0%	7%	0%	7%	4%	11%	4%	11%	0%	10%	0%	10%

The estimated gross and net dollar value of processed materials is shown in detail for the above described production options on the flow charts shown on the attached Figures 8 through 10, and

summarized in the following table. These estimated gross and net dollar values are based on the estimated values of individual products and production costs presented, and a gross mass of processed material of 50,000 tons, chosen arbitrarily as a readily scalable value.

Based on 50,000 Tons of Processed Material			
Site	**Gross Value**	**Net Value**	**Estimated Net Value per Ton of Source Material(4)**
May SPS	$274,031 to $368,216(1)	$73,930 to $101,139(1)	$1.48 to $2.02
Devil's Gate Reservoir	$261,497 to $270,876(2)	$11,412 to $20,791(2)	$0.22 to $0.41
Santa Fe Dam	$220,485 to $296,243(3)	$20,485 to $32,270(3)	$0.41 to $0.65
		Average	**$1.12**

(1) See Options 1 through 4, Figure 8.
(2) See Options 2 and 4, Figure 9.
(3) See Options 1 through 4, Figure 10.
(4) The apparent higher value of May SPS materials relative to the other sites is a result of the absence of poorer quality Category A materials, which generally produce low value Top Soil and negative value Waste. Similar higher values may be obtained from the Devil's Gate Reservoir and Santa Fe Dam sites by selectively extracting Category B and C material.

SUMMARY OF FINDINGS

Based on the results of our field explorations, laboratory testing and economic analyses, the following conclusions are presented:

Major Findings

- Materials accumulating in debris basins or reservoirs have commercial value, once processed into construction materials, which may offset some of the cost of cleaning out these facilities.
- In addition, the service life of existing SPS's may be extended by diverting material from these disposal sites to useful applications.
- A pilot plant will help identify costs or obstacles associated with plant logistics, processes, marketing and distribution before any large scale investments are considered.
- The cost of the pilot plant, excluding handling at the source or transportation to the pilot plant, will be significantly offset by the value of the materials produced.

Other Findings

- Because of the low value of Top Soil with respect to the production cost and the amount of Waste associated with materials containing more than 70 percent fines, processing Category A materials should be avoided.

- Based on the Devil's Gate Reservoir results, Category A materials are anticipated to be present at the downstream, lowest reach of the reservoir, which is the location most critical to be cleaned out. This is an unfavorable condition.
- The cost of cleaning out the lower reach of Devil's Gate Reservoir where Category A materials are anticipated to prevail may be offset by extracting more favorable materials at the middle to upper reaches.
- Inclusion of Washed Sand in the final mix of products generally results in an overall higher valuation. However, with a relatively small reduction in the value of Washed Sand from $15 to $13 per ton, which may be anticipated in the current economic conditions, the inclusion of higher value Washed Sand is no longer predicted to result in a significantly higher overall valuation due to the relatively small gain in value with respect to the increased cost of waste disposal.
- However, although unwashed materials may have a similar net valuation to higher value Washed Sand pending the relative cost of waste disposal to the marketable value of Washed Sand, such materials may not be in sufficient demand to keep up with production and substantial stockpiling may be necessary.

PILOT STUDY PLAN

The following additional investigations are recommended.

- A pilot production plant is recommended to verify the validity of the processes summarized in the attached flow charts, including the quantities of materials and waste generated and the logistics of the operations. Because of the substantial costs associated with a wet process including permitting, staging, water usage, and waste silt disposal, the pilot production plant is recommended to be deployed in two separate mobilizations, an initial dry process mobilization and a second wet process mobilization. The dry process mobilization is anticipated to consist of the following:

    - A 4-inch grizzly to screen out oversized cobbles
    - A power double-screen having a 1-inch screen and a ⅜-inch screen
    - As an option, a second single ⅜-inch screen may also be provided and dedicated to the production of Top Soil where materials with organic impurities are prevalent
    - A crusher
    - A front-end loader
    - A tractor-dozer
    - A plant supervisor
    - An equipment operator
    - A laborer

Photograph (right) – Power Double-Screen Operation

- The wet process mobilization is anticipated to consist of the following in addition to the above:

    - A ⅜-inch wash screen
    - At least 3 successive desilting ponds and an estimated water supply of 300,000 gallons per day
    - A stormwater pollution prevention plan
    - A disposal site for waste silt

- The associated costs, based on the pilot production plant, including permitting, labor, equipment rental and maintenance, and ancillary costs will be evaluated and compared with the gross processed product valuation.

- The erosion and deposition model under development as part of this study should be integrated with the source material categories presented herein to evaluate whether an integrated model to predict processed product valuation is feasible. This will allow for preliminary evaluation for the likely options for the final processed product.

For a pilot plant, the upfront and fixed costs become a smaller proportion of the overall cost as the duration of the pilot production program increases. As a result, we recommend a minimum of 3 months for the dry process phase of the pilot production program. For the purposes of this analyses and report, we assume that the pilot plant will be mobilized to the May SPS. We understand that material will not be recycled from the May SPS, but will be transported to the May SPS pilot plant by others.

To facilitate a pilot production program, a quote was obtained from a local contractor, O&B Equipment, to provide the equipment and operators for the pilot plant described above. The provided quote is summarized as follows.

- Mobilization and start up costs: $22,000
- Dry processing by double-screening: $2/ton
- Crushing of course materials, if any: $6,000/week (expect crushing for 1 week out of every 4 weeks of production)

The costs associated with the pilot plant, excluding handling at the source and transportation to the pilot plant, are anticipated to be significantly offset by the value of the material produced, as predicted by our model and summarized in the table below.

Material	Gross Value[(1)]	Estimated Production Cost	Estimated Waste Disposal Cost	Net Value
May SPS-type Materials	$411,000	$190,000	$1,000	$220,000
Devil's Gate Reservoir-type Materials	$290,000	$190,000	$46,000	$54,000
Santa Fe Dam-type Materials	$331,000	$190,000	$1,000	$140,000
Average	**$344,000**	**$190,000**	**$16,000**	**$138,000**
Estimated Engineering and Management Fees				**$55,000**
Net Cost				**$83,000 credit**

(1) Estimated as the Gross Value from Option 1 (i.e., no wet processing) of Figures 8, 9 and 10, for the May SPS, Devil's Gate Reservoir, and the Santa Fe Dam, respectively, scaled by a factor of 1.5 to account for 75,000 tons processed during the pilot plant operation.

In summary, our fees for the pilot study at May SPS are anticipated to be **$245,000**, including an estimated $190,000 in production and $55,000 in engineering and management fees. Our estimated fees do not include any transportation, neither from the source to the pilot plant nor from the pilot plant to a buyer, or any waste disposal.

The total cost of the pilot study will also include transportation provided by others. These costs may be wholly or partially offset by the estimated gain of $83,000 derived from the produced materials, pending haul rates and distances.

Our estimated fees are based on a quote from our subcontractor, O&B Equipment, and the following assumptions:

- Approximately 75,000 tons of source material will be processed in a period of 3 months, i.e., the anticipated production rate is 25,000 tons per month.
- The May SPS, or a similar suitable and accessible site, will be made available for the pilot plant. Approximately at least 2 acres are required.
- Source materials will either be readily available on site or transported to the pilot plant by others.
- Waste will be disposed of by others.
- Water will be provided by others for dust control or similar purposes, and is not included in our estimated fees presented above.

- A loader at the source locations will be provided by others to excavate and handle source materials, and is not included in our estimated fees presented above.

LIMITATIONS

The pilot study test sites were explored to the degree practicable. The following limitations of the methods used should be considered when evaluating the data presented.

- For the May SPS site, only the uppermost cell of the disposal site was investigated. Materials encountered in the test pits were limited to a relatively narrow gradation range falling into material Category B. This result may not be representative of the site as a whole, where broader material gradation is anticipated.
- The Devil's Gate Reservoir site was explored more comprehensively than the other sites and is considered to be most representative of the types of materials to be derived from reservoirs of this nature.
- Large reservoirs such as the Devil's Gate show a large degree of downstream sorting of materials, with Category A materials near the dam and a gradual transition to coarse materials from Categories B to C upstream. Category D materials were not encountered but are expected at the headwaters where high flow velocities or steep slopes subject to sediment gravity flows prevail. As a result, if material is selectively removed from the downstream end near the dam where removal is most critical, only poorer quality Category A materials should be anticipated.
- For the Santa Fe Dam site, only the upper few feet of the stockpile were explored by hand-auger explorations, and therefore the sampling cannot be considered representative of the stockpile as a whole.

CLOSURE

Tetra Tech appreciates the opportunity to be of service on this project. If you have any questions regarding this letter or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
Tetra Tech

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President

Filename: Final Report - Sediment Characterization and Potential Use Assessment 2011-10-06.doc

Distribution: Addressee (1 hardcopy + pdf by email to dsharp@dpw.lacounty.gov)

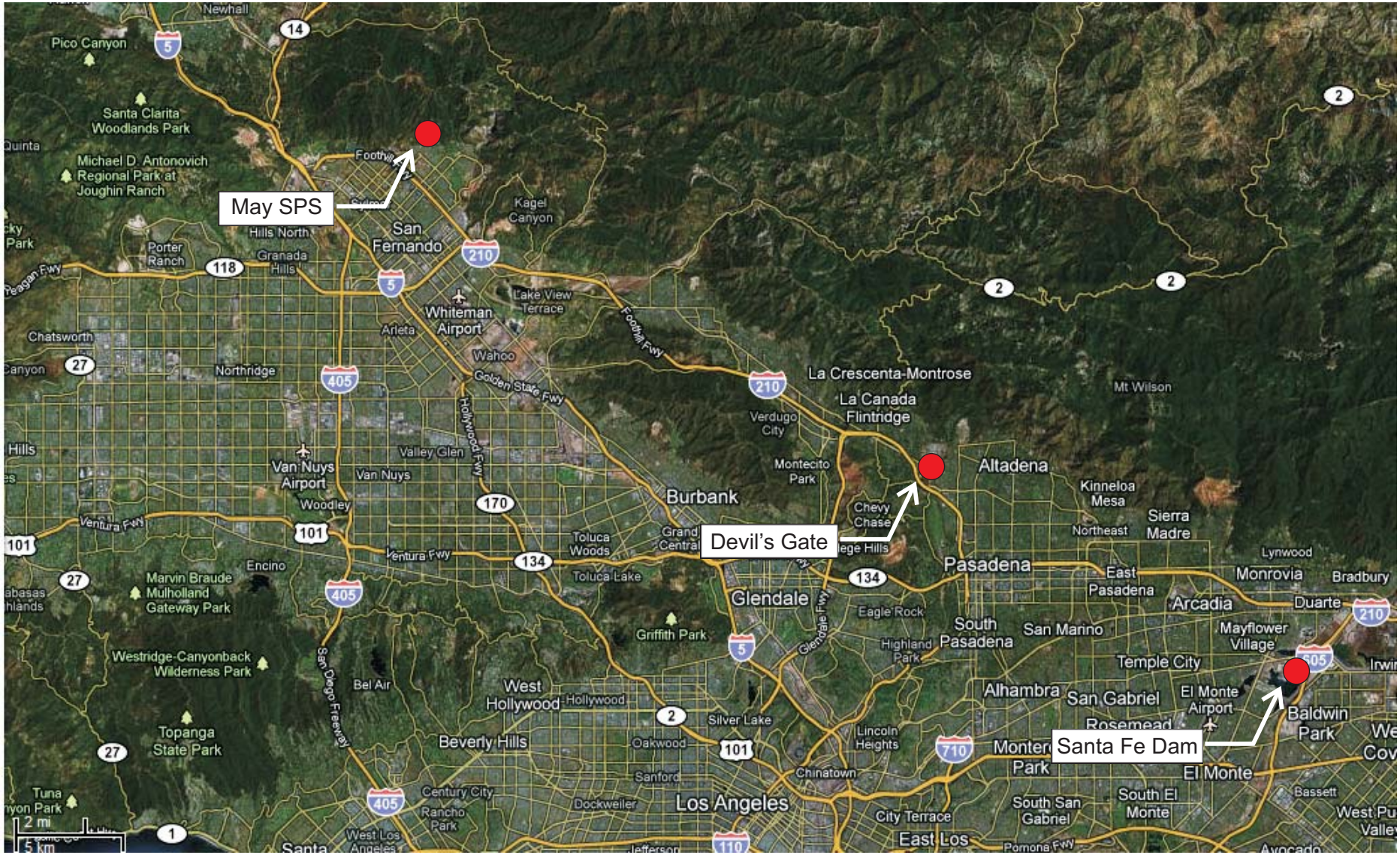
REFERENCES

ASTM D5268, "Standard Specification for Topsoil Used for Landscaping Purposes."

ASTM C33, "Standard Specification for Concrete Aggregates."

ASTM D1241, "Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses."

Sundborg, A., 1956, "The River Klarälven, a Study of Fluvial Processes," Geografiska Annaler, Ser. A, Vol. 38, Fig. 16, p. 197.



NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

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Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

DATE: August 2011

LACDPW Sedimentation Study

Site Location Map

Figure: 1

Legend:

TP-4 Test pit locations

Soil Category B: SP-SM/SM, SW-SM/SM, SM

N

0 50' 100'

NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

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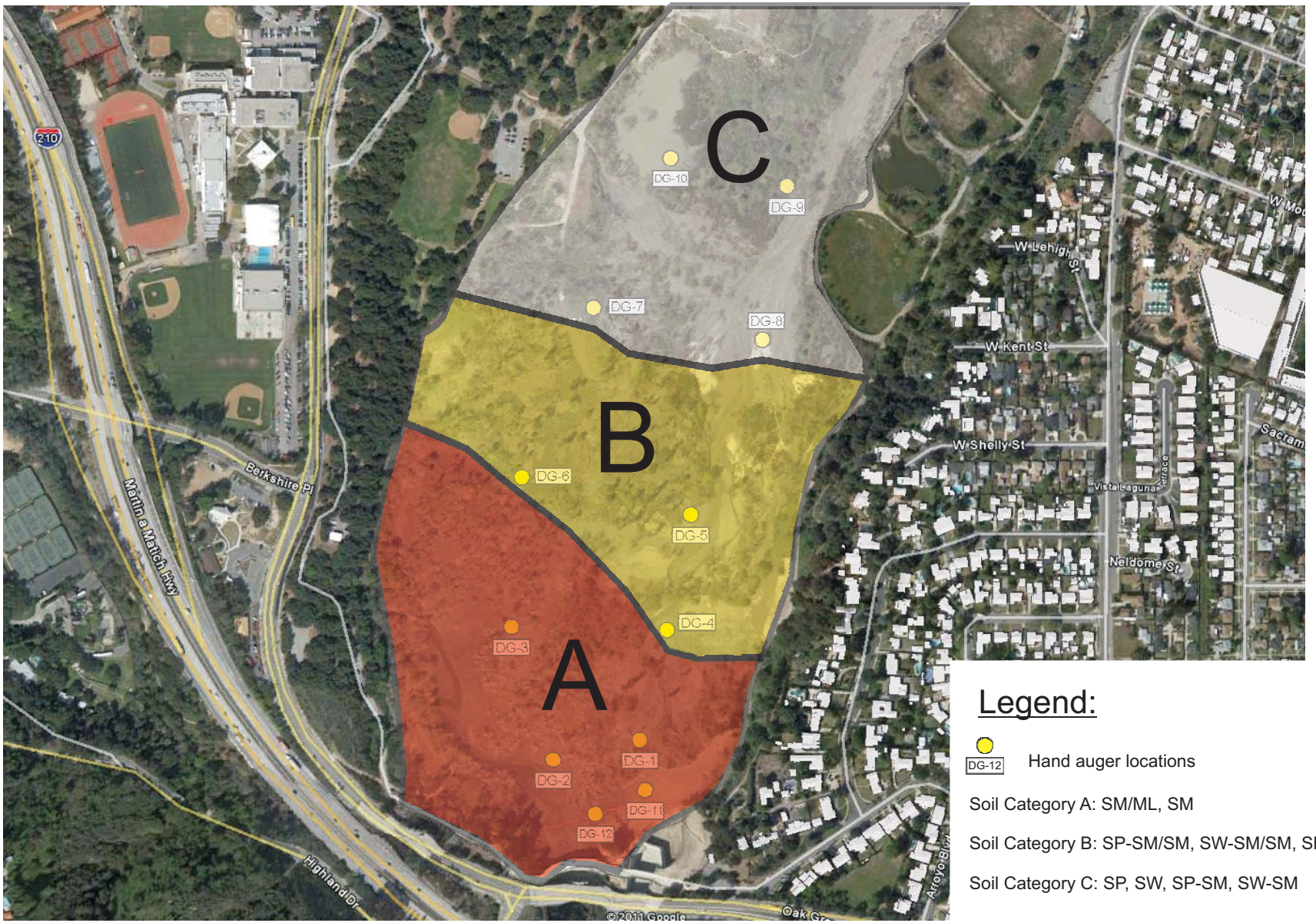
May SPS
Exploration Location and Soil Category Map

Figure: 2



Legend:

DG-12 Hand auger locations

Soil Category A: SM/ML, SM

Soil Category B: SP-SM/SM, SW-SM/SM, SM

Soil Category C: SP, SW, SP-SM, SW-SM

N

0 300' 600'

NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

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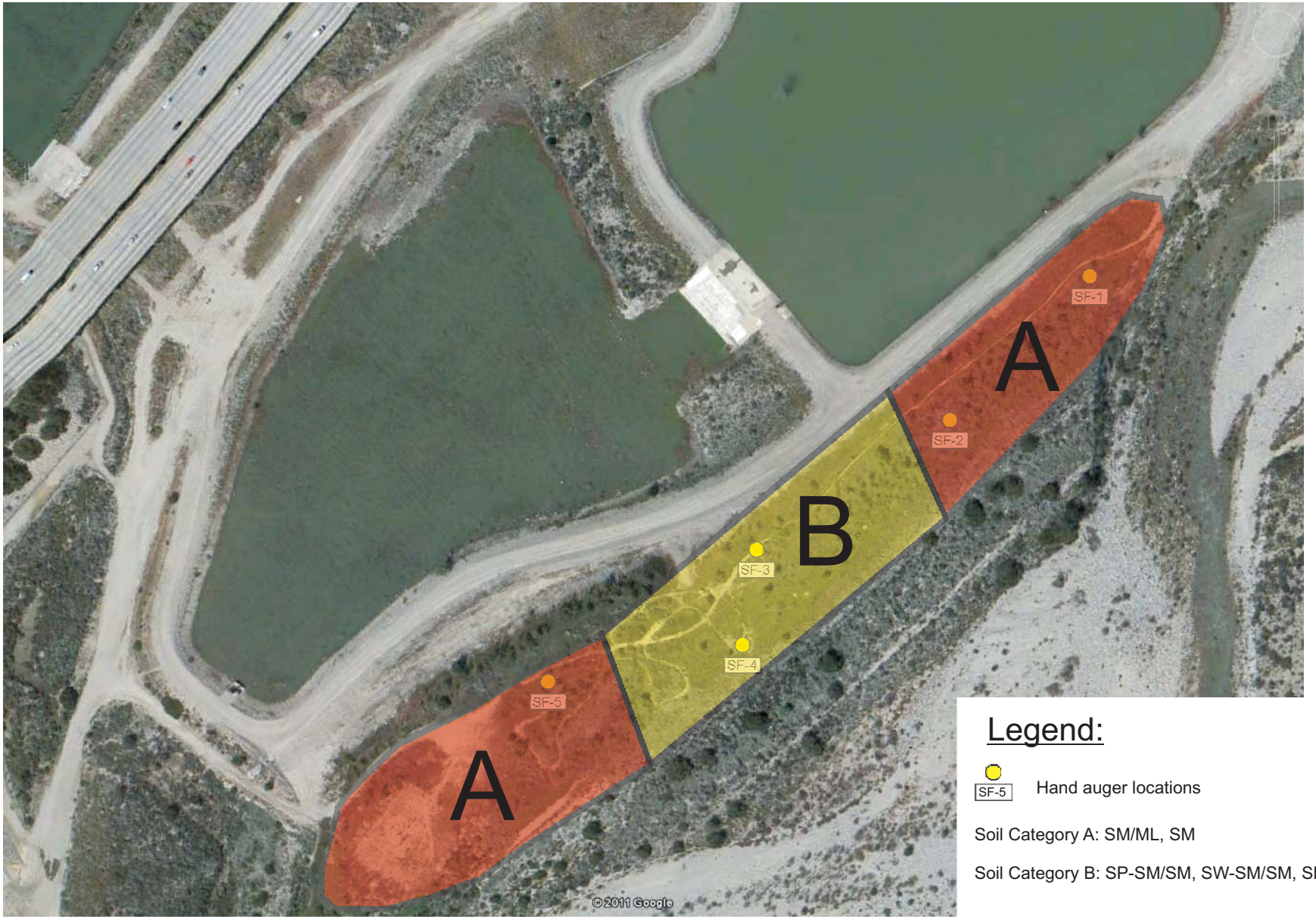
Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

DATE: August 2011

Devil's Gate
Exploration Location and Soil Category Map

Figure: 3



Legend:

SF-5 Hand auger locations

Soil Category A: SM/ML, SM

Soil Category B: SP-SM/SM, SW-SM/SM, SM

N

0 100' 200'

NOTE: ALL LOCATIONS, DIRECTIONS AND DIMENSIONS ARE APPROXIMATE

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Phone (909) 860-5096

Project Name: LACDPW Sedimentation Study

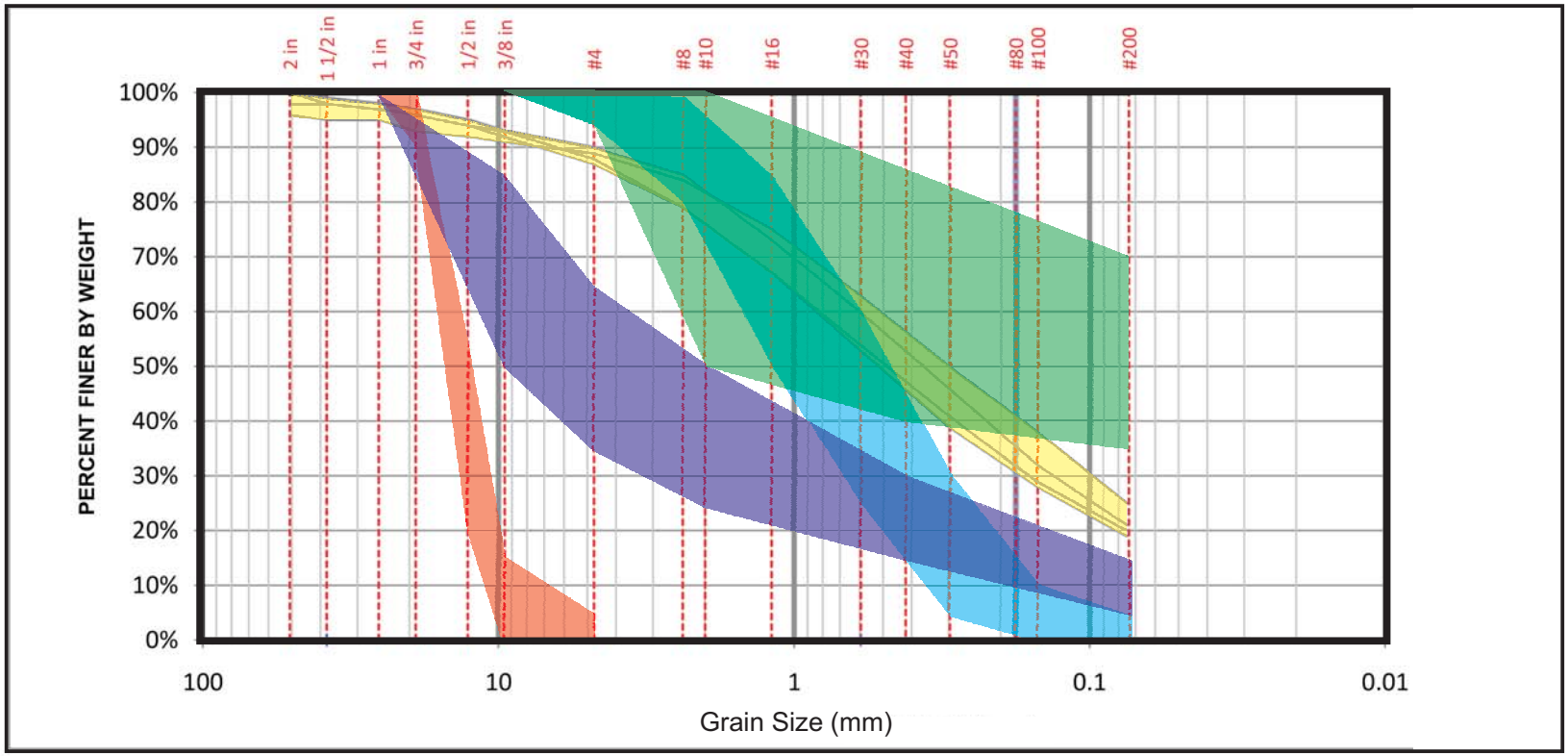
Project Number: BAS 11-58E

DATE: August 2011

Santa Fe Dam
Exploration Location and Soil Category Map

Figure: 4

Soil Gradation Results for May SPS



LEGEND:

- Specification for #6 Coarse Aggregate (ASTM C 33)
- Specification for Fine Aggregate (ASTM C 33)
- Site soils
- Suggested gradation meeting specification for Topsoil (ASTM D 5268)
- Specification for Aggregate Base Gradation C (ASTM D 1241)

TETRA TECH
1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

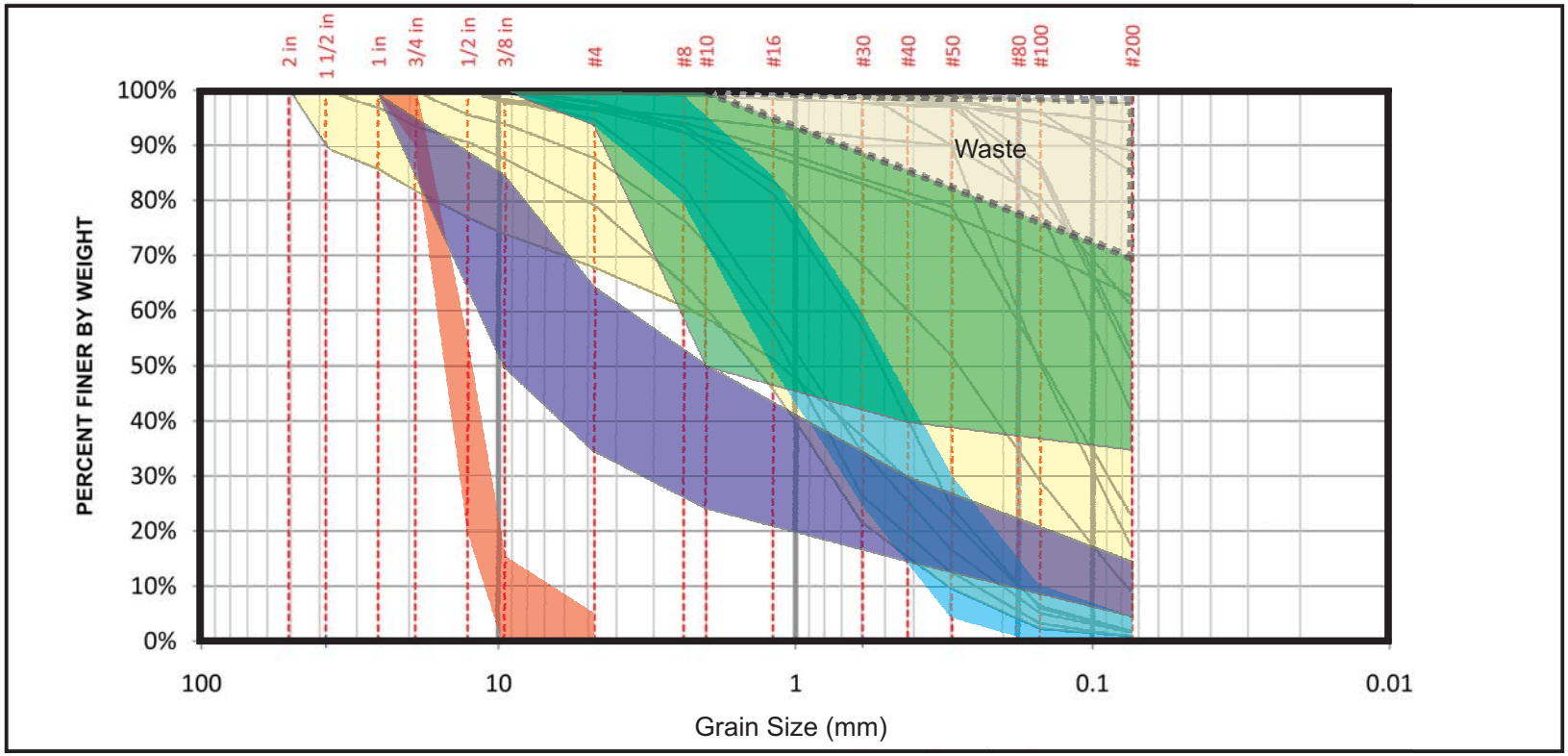
DATE: July 2011

LACDPW Sedimentation Study

May SPS

FIGURE 5

Soil Gradation Results for Devil's Gate



LEGEND:

- Specification for #6 Coarse Aggregate (ASTM C 33)
- Specification for Fine Aggregate (ASTM C 33)
- Site soils
- Suggested gradation meeting specification for Topsoil (ASTM D 5268)
- Specification for Aggregate Base Gradation C (ASTM D 1241)

TETRA TECH
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Phone (909) 860-5096

Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

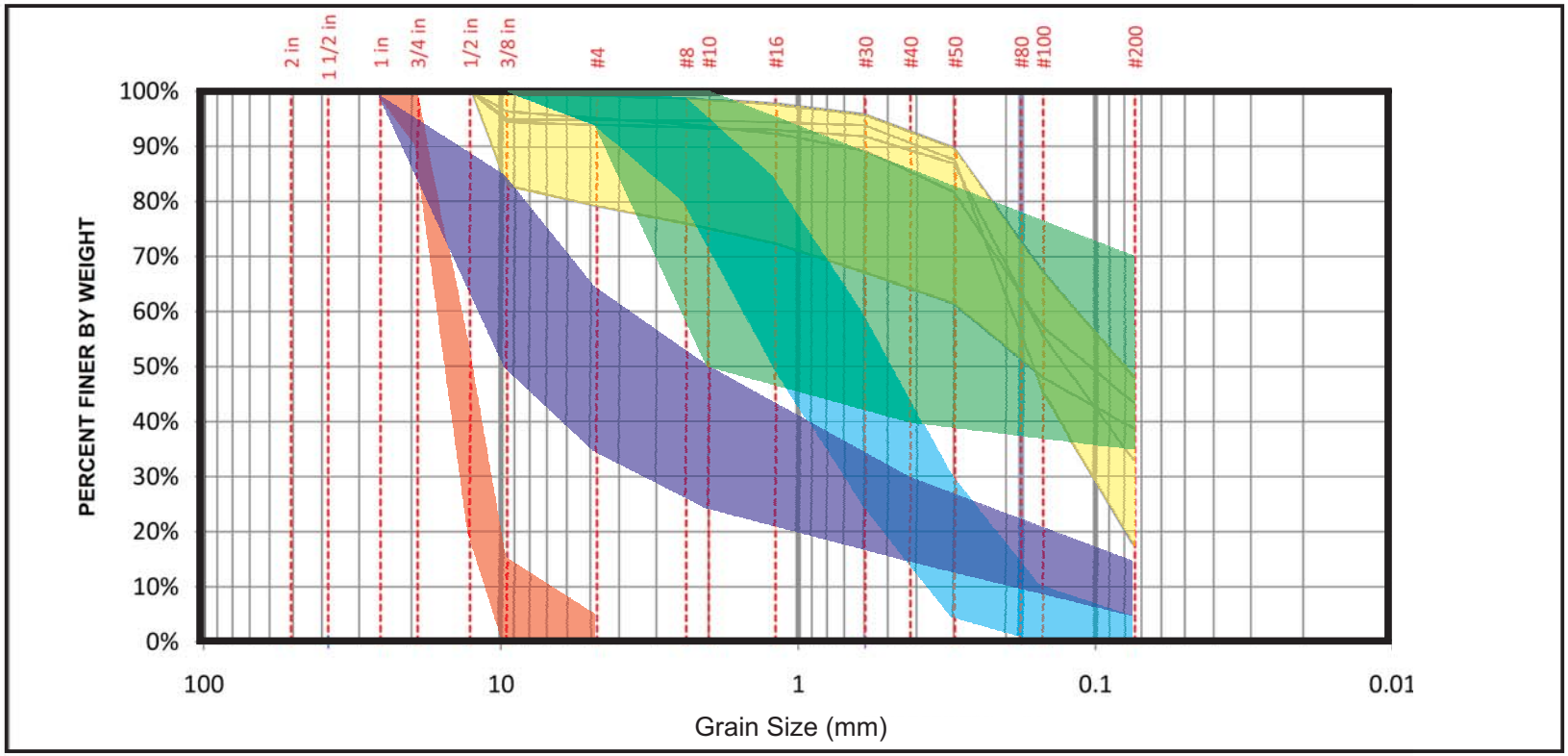
DATE: July 2011

LACDPW Sedimentation Study

Devil's Gate

FIGURE 6

Soil Gradation Results for Santa Fe Dam



LEGEND:

- Specification for #6 Coarse Aggregate (ASTM C 33)
- Specification for Fine Aggregate (ASTM C 33)
- Site soils
- Suggested gradation meeting specification for Topsoil (ASTM D 5268)
- Specification for Aggregate Base Gradation C (ASTM D 1241)

TETRA TECH
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Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

DATE: July 2011

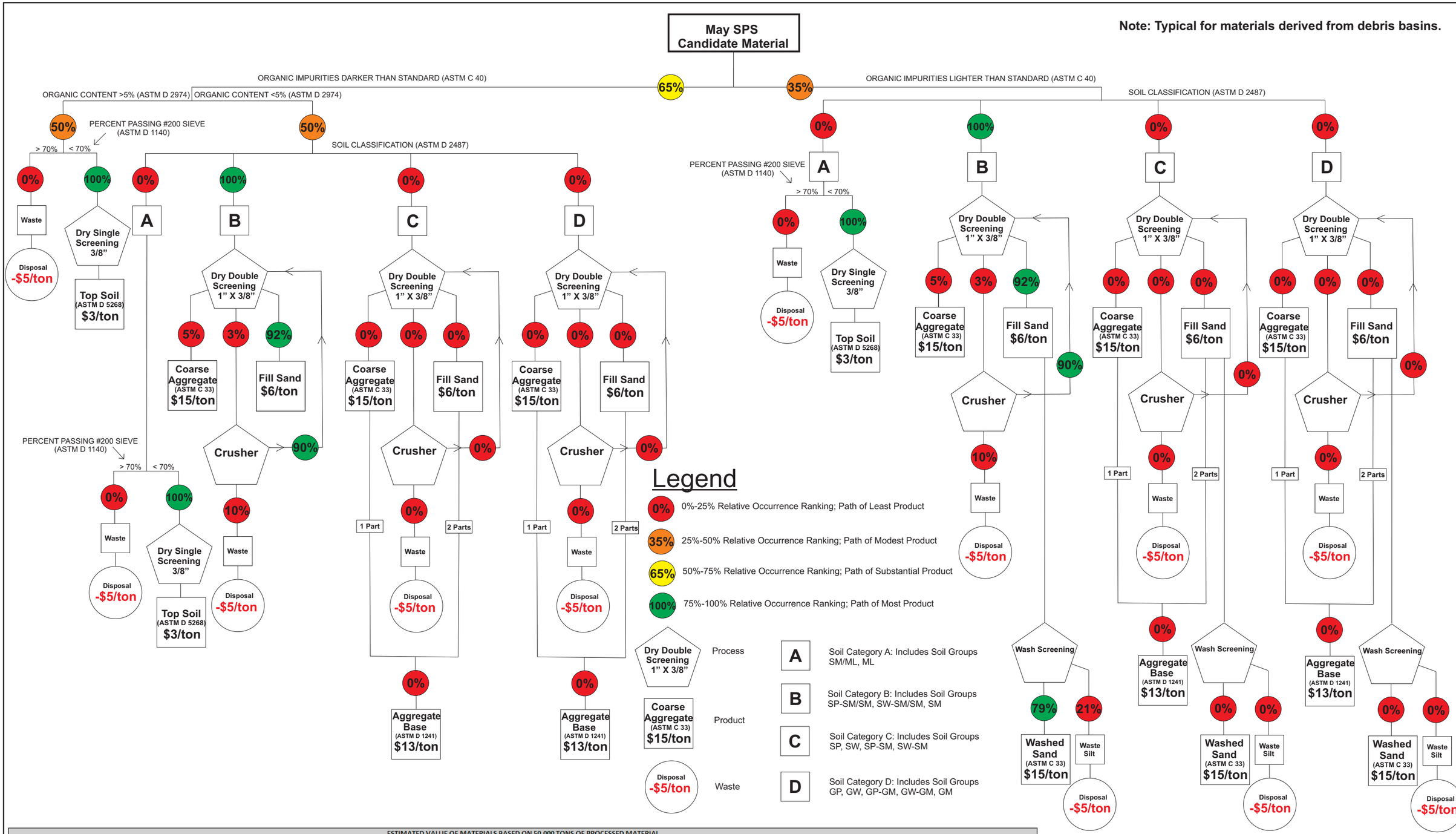
LACDPW Sedimentation Study

Santa Fe Dam

FIGURE 7

May SPS Candidate Material

Note: Typical for materials derived from debris basins.



ESTIMATED VALUE OF MATERIALS BASED ON 50,000 TONS OF PROCESSED MATERIAL																
Product	Option 1 - No Washed Sand, No Aggregate Base				Option 2 - Washed Sand, No Aggregate Base				Option 3 - No Washed Sand, Aggregate Base				Option 4 - Washed Sand, Aggregate Base			
	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value
Top Soil	16,250	$48,750	-$65,000	-$16,250	16,250	$48,750	-$65,000	-$16,250	16,250	$48,750	-$65,000	-$16,250	16,250	$48,750	-$65,000	-$16,250
Fill Sand	31,050	$186,300	-$124,200	$62,100	14,950	$89,700	-$59,800	$29,900	31,050	$186,300	-$124,200	$62,100	14,950	$89,700	-$59,800	$29,900
Coarse Aggregate	2,599	$38,981	-$10,395	$28,586	2,599	$38,981	-$10,395	$28,586	2,599	$38,981	-$10,395	$28,586	2,599	$38,981	-$10,395	$28,586
Aggregate Base	--	--	--	--	--	--	--	--	0	$0	$0	$0	0	$0	$0	$0
Washed Sand	--	--	--	--	12,719	$190,785	-$114,471	$76,314	--	--	--	--	12,719	$190,785	-$114,471	$76,314
Waste	101	--	-$506	-$506	3,482	--	-$17,411	-$17,411	101	--	-$506	-$506	3,482	--	-$17,411	-$17,411
	TOTALS	$274,031	-$200,101	$73,930		$368,216	-$267,077	$101,139		$274,031	-$200,101	$73,930		$368,216	-$267,077	$101,139

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Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

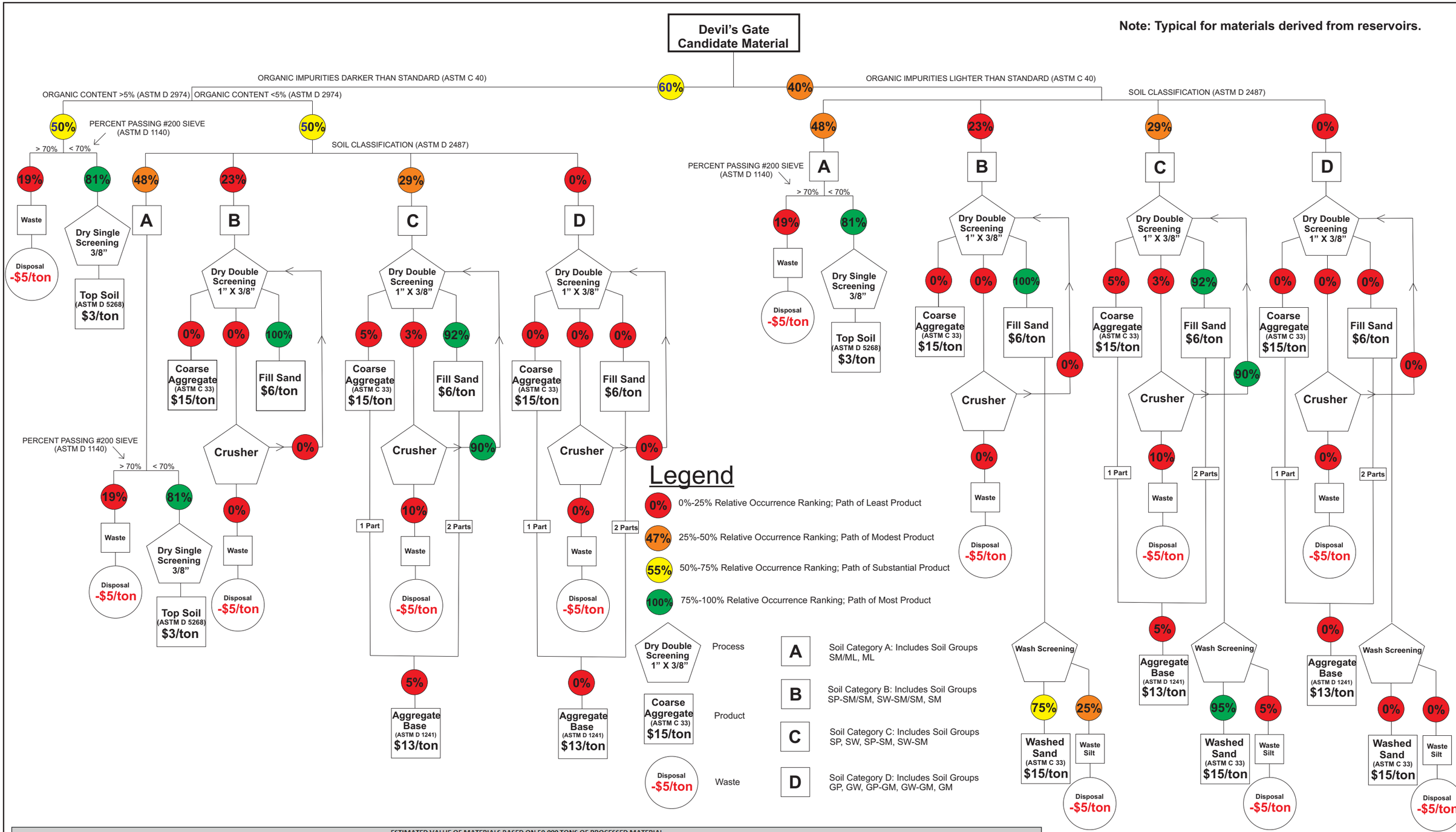
DATE: August 2011

Candidate Material Flow Chart for May SPS

Figure 8

Devil's Gate Candidate Material

Note: Typical for materials derived from reservoirs.



ESTIMATED VALUE OF MATERIALS BASED ON 50,000 TONS OF PROCESSED MATERIAL

Product	Option 1 - No Washed Sand, No Aggregate Base				Option 2 - Washed Sand, No Aggregate Base				Option 3 - No Washed Sand, Aggregate Base				Option 4 - Washed Sand, Aggregate Base			
	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value
Top Soil	25,758	$77,274	-$103,032	-$25,758	25,758	$77,274	-$103,032	-$25,758	25,758	$77,274	-$103,032	-$25,758	25,758	$77,274	-$103,032	-$25,758
Fill Sand	17,388	$104,328	-$69,552	$34,776	7,452	$44,712	-$29,808	$14,904	15,825	$94,949	-$63,300	$31,650	5,889	$35,333	-$23,556	$11,778
Coarse Aggregate	782	$11,723	-$3,126	$8,597	782	$11,723	-$3,126	$8,597	0	$0	$0	$0	0	$0	$0	$0
Aggregate Base	--	--	--	--	--	--	--	--	2,345	$30,480	-$9,379	$21,102	2,345	$30,480	-$9,379	$21,102
Washed Sand	--	--	--	--	8,519	$127,788	-$76,673	$51,115	--	--	--	--	8,519	$127,788	-$76,673	$51,115
Waste	6,072	--	-$30,362	-$30,362	7,489	--	-$37,446	-$37,446	6,072	--	-$30,362	-$30,362	7,489	--	-$37,446	-$37,446
	TOTALS	**$193,325**	**-$206,072**	**-$12,747**		**$261,497**	**-$250,085**	**$11,412**		**$202,704**	**-$206,072**	**-$3,369**		**$270,876**	**-$250,085**	**$20,791**

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Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

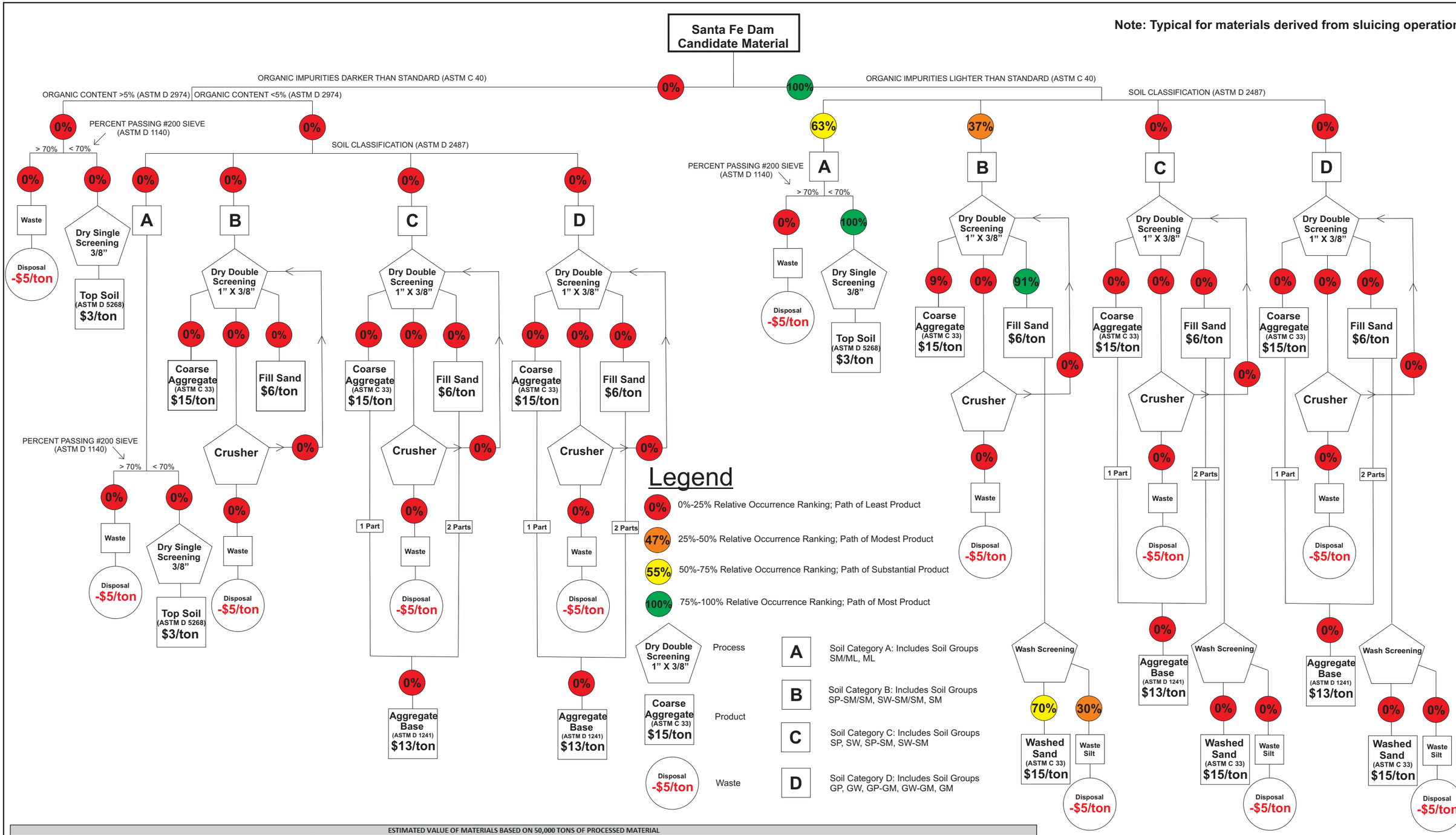
DATE: August 2011

Candidate Material Flow Chart for Devil's Gate

Figure 9

Santa Fe Dam Candidate Material

Note: Typical for materials derived from sluicing operations.



ESTIMATED VALUE OF MATERIALS BASED ON 50,000 TONS OF PROCESSED MATERIAL

Product	Option 1 - No Washed Sand, No Aggregate Base				Option 2 - Washed Sand, No Aggregate Base				Option 3 - No Washed Sand, Aggregate Base				Option 4 - Washed Sand, Aggregate Base			
	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value	Quantity (tons)	Gross Value	Estimated Cost	Net Value
Top Soil	31,500	$94,500	-$126,000	-$31,500	31,500	$94,500	-$126,000	-$31,500	31,500	$94,500	-$126,000	-$31,500	31,500	$94,500	-$126,000	-$31,500
Fill Sand	16,835	$101,010	-$67,340	$33,670	0	$0	$0	$0	16,835	$101,010	-$67,340	$33,670	0	$0	$0	$0
Coarse Aggregate	1,665	$24,975	-$6,660	$18,315	1,665	$24,975	-$6,660	$18,315	1,665	$24,975	-$6,660	$18,315	1,665	$24,975	-$6,660	$18,315
Aggregate Base	--	--	--	--	--	--	--	--	0	$0	$0	$0	0	$0	$0	$0
Washed Sand	--	--	--	--	11,785	$176,768	-$106,061	$70,707	--	--	--	--	11,785	$176,768	-$106,061	$70,707
Waste	0	--	$0	$0	5,051	--	-$25,253	-$25,253	0	--	$0	$0	5,051	--	-$25,253	-$25,253
	TOTALS	$220,485	-$200,000	$20,485		$296,243	-$263,973	$32,270		$220,485	-$200,000	$20,485		$296,243	-$263,973	$32,270

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Phone (909) 860-5096

Project Name: LACDPW Sedimentation Study

Project Number: BAS 11-58E

DATE: August 2011

Candidate Material Flow Chart for Santa Fe Dam

Figure 10

Appendix A

Laboratory Test Results

SMITH-EMERY Laboratories

Sieve Analysis of Aggregate

ASTM C136

791/781 East Washington Boulevard, Los Angeles, CA 90021

Tel. No. (213) 745-5333; Fax No. (213) 746-0744

Client: KFM GeoScience

Project: LADPW Sedimentation Study

Location:

Material Description: Brown SILTY SAND

Source:

Remark: Sampled by client

SEL REPORT No.: G-11-8507

SEL FILE No.: 40126-1

Date Tested: 6/14/11

Date Sampled: NA

Sample No.: TP-2

Depth: 0–4

Sieve Size	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Percent Passing	**98**	**98**	**97**	**96**	**94**	**92**	**87**	**79**	**67**	**53**	**39**	**28**	**19**
C33 Lower Limit						100	95	80	50	25	5	0	
C33 Upper Limit						100	100	100	85	60	30	10	

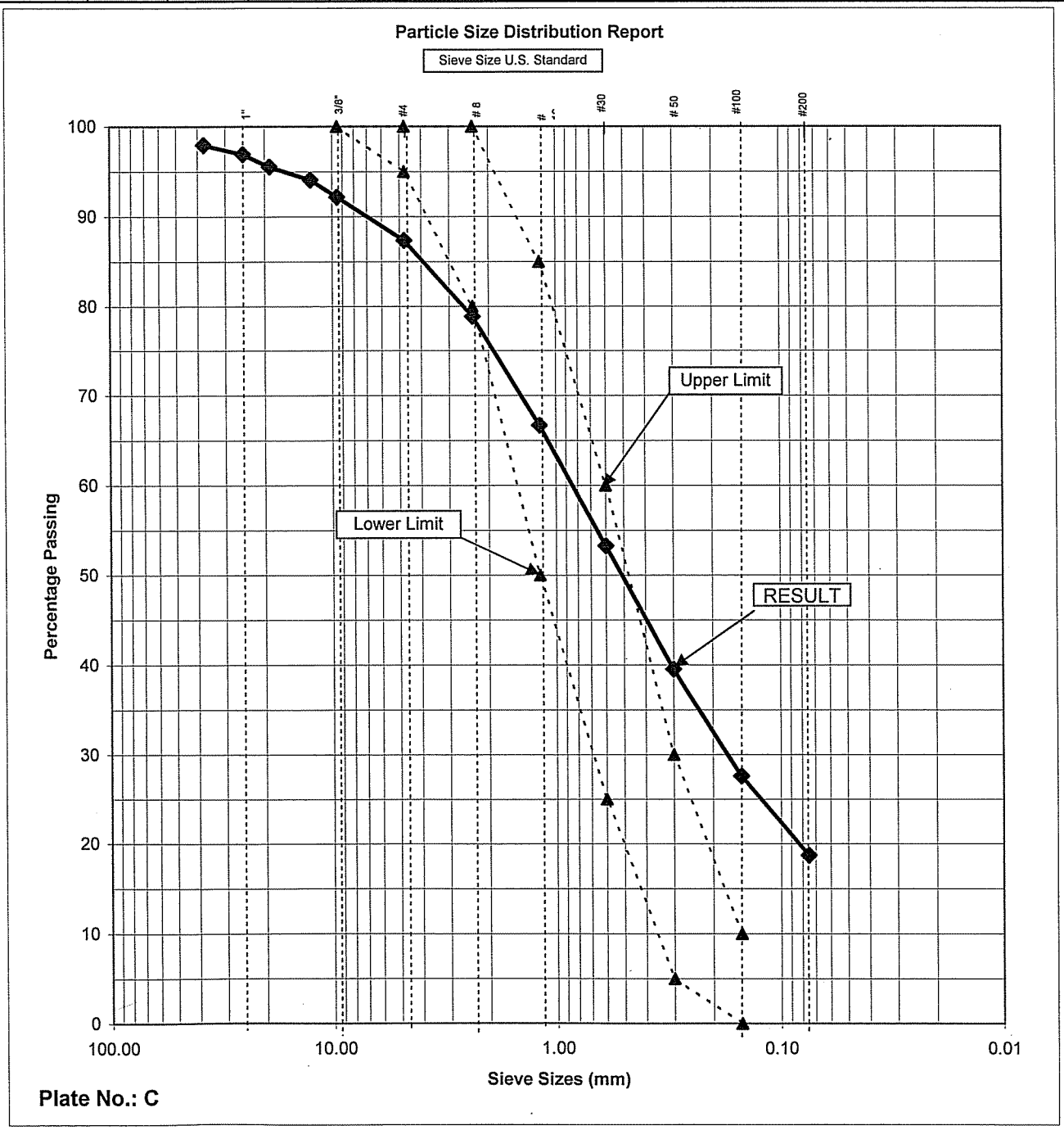


Plate No.: C

SMITH-EMERY Laboratories

Sieve Analysis of Aggregate

ASTM C136

791/781 East Washington Boulevard, Los Angeles, CA 90021

Tel. No. (213) 745-5333; Fax No. (213) 746-0744

Client: KFM GeoScience

Project: LADPW Sedimentation Study

Location:

Material Description: Black SILTY SAND

Source:

Remark: Sampled by client

SEL REPORT No.: G-11-8507

SEL FILE No.: 40126-1

Date Tested: 6/14/11

Date Sampled: NA

Sample No.: TP-2

Depth: 5–11

Sieve Size	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Percent Passing	**100**	**98**	**97**	**96**	**94**	**93**	**90**	**85**	**73**	**60**	**46**	**32**	**21**
C33 Lower Limit						100	95	80	50	25	5	0	
C33 Upper Limit						100	100	100	85	60	30	10	

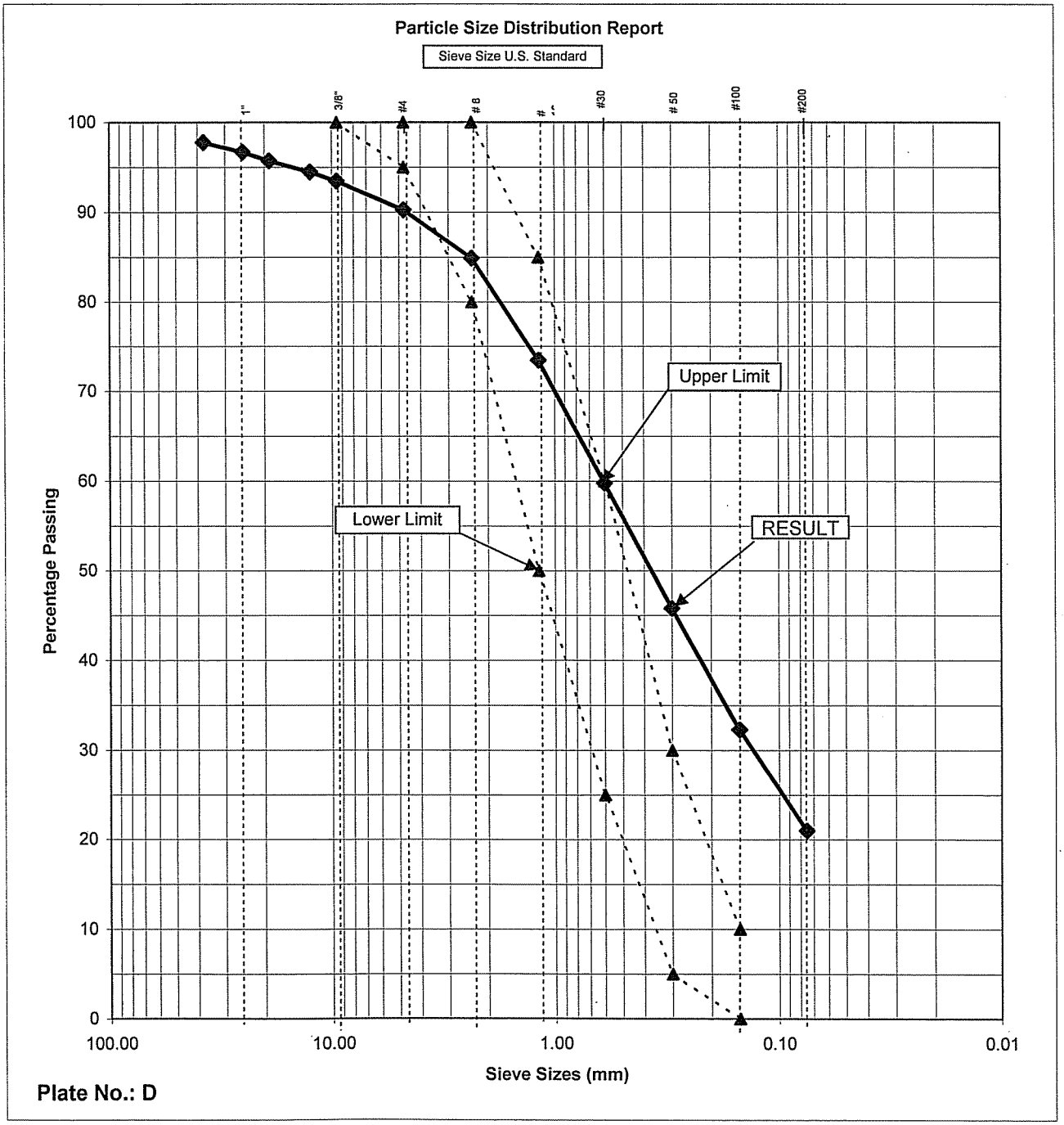


Plate No.: D

SMITH-EMERY Laboratories

Sieve Analysis of Aggregate

ASTM C136

791/781 East Washington Boulevard, Los Angeles, CA 90021

Tel. No. (213) 745-5333; Fax No. (213) 746-0744

Client: KFM GeoScience

Project: LADPW Sedimentation Study

Location:

Material Description: Brown SILTY SAND

Source:

Remark: Sampled by client

SEL REPORT No.: G-11-8507

SEL FILE No.: 40126-1

Date Tested: 6/14/11

Date Sampled: NA

Sample No.: TP-3

Depth: 0–3

Sieve Size	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Percent Passing	**100**	**99**	**98**	**97**	**95**	**93**	**88**	**79**	**67**	**54**	**41**	**29**	**20**
C33 Lower Limit						100	95	80	50	25	5	0	
C33 Upper Limit						100	100	100	85	60	30	10	

Particle Size Distribution Report

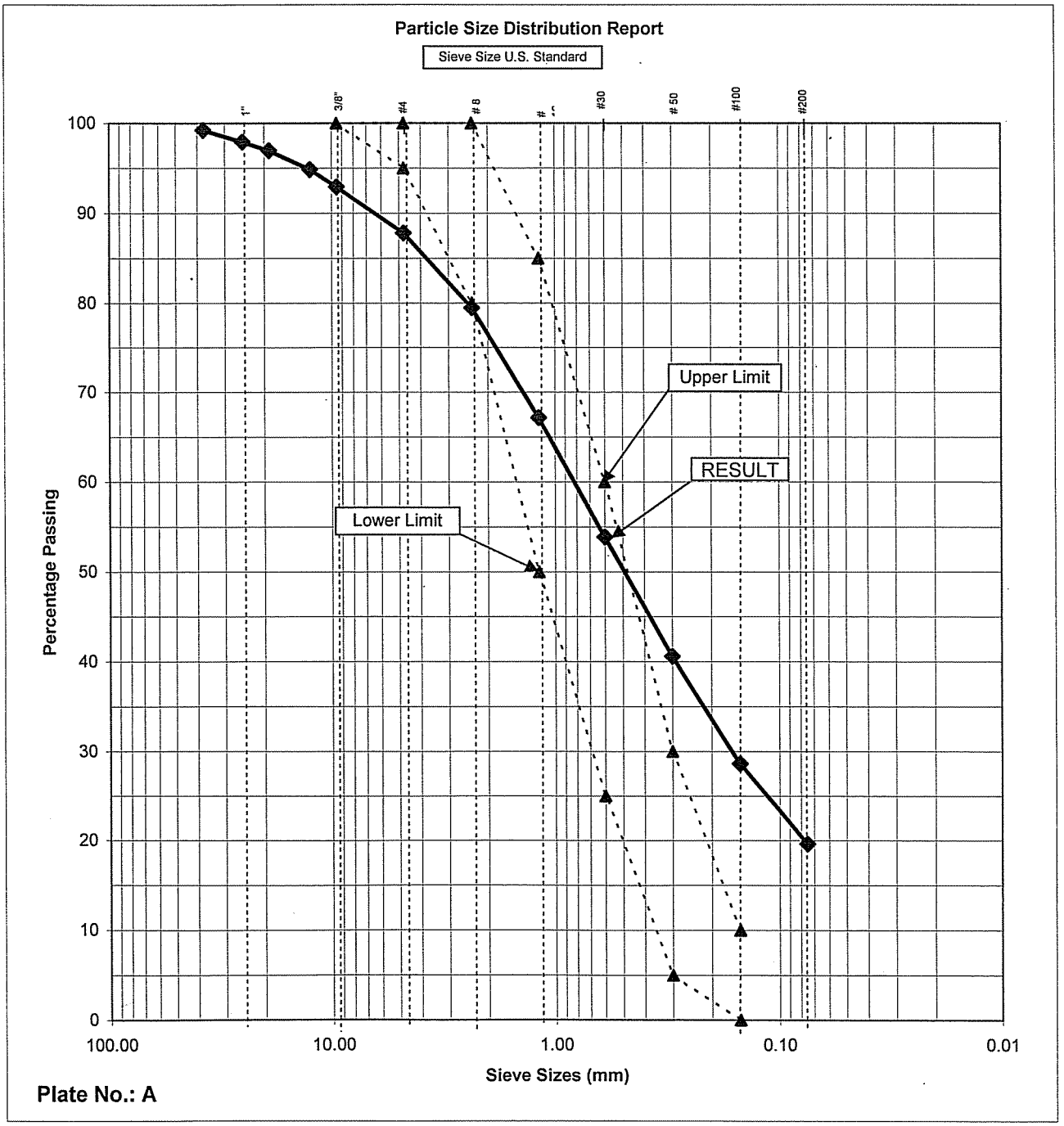


Plate No.: A

SMITH-EMERY Laboratories

Sieve Analysis of Aggregate

ASTM C136

791/781 East Washington Boulevard, Los Angeles, CA 90021

Tel. No. (213) 745-5333; Fax No. (213) 746-0744

Client: KFM GeoScience

Project: LADPW Sedimentation Study

Location:

Material Description: Black SILTY SAND

Source:

Remark: Sampled by client

SEL REPORT No.: G-11-8507

SEL FILE No.: 40126-1

Date Tested: 6/14/11

Date Sampled: NA

Sample No.: TP-3

Depth: 3–12

Sieve Size	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No.4	No.8	No.16	No.30	No.50	No.100	No.200
Percent Passing	**96**	**95**	**95**	**93**	**92**	**91**	**89**	**84**	**75**	**63**	**50**	**38**	**25**
C33 Lower Limit						100	95	80	50	25	5	0	
C33 Upper Limit						100	100	100	85	60	30	10	

Particle Size Distribution Report

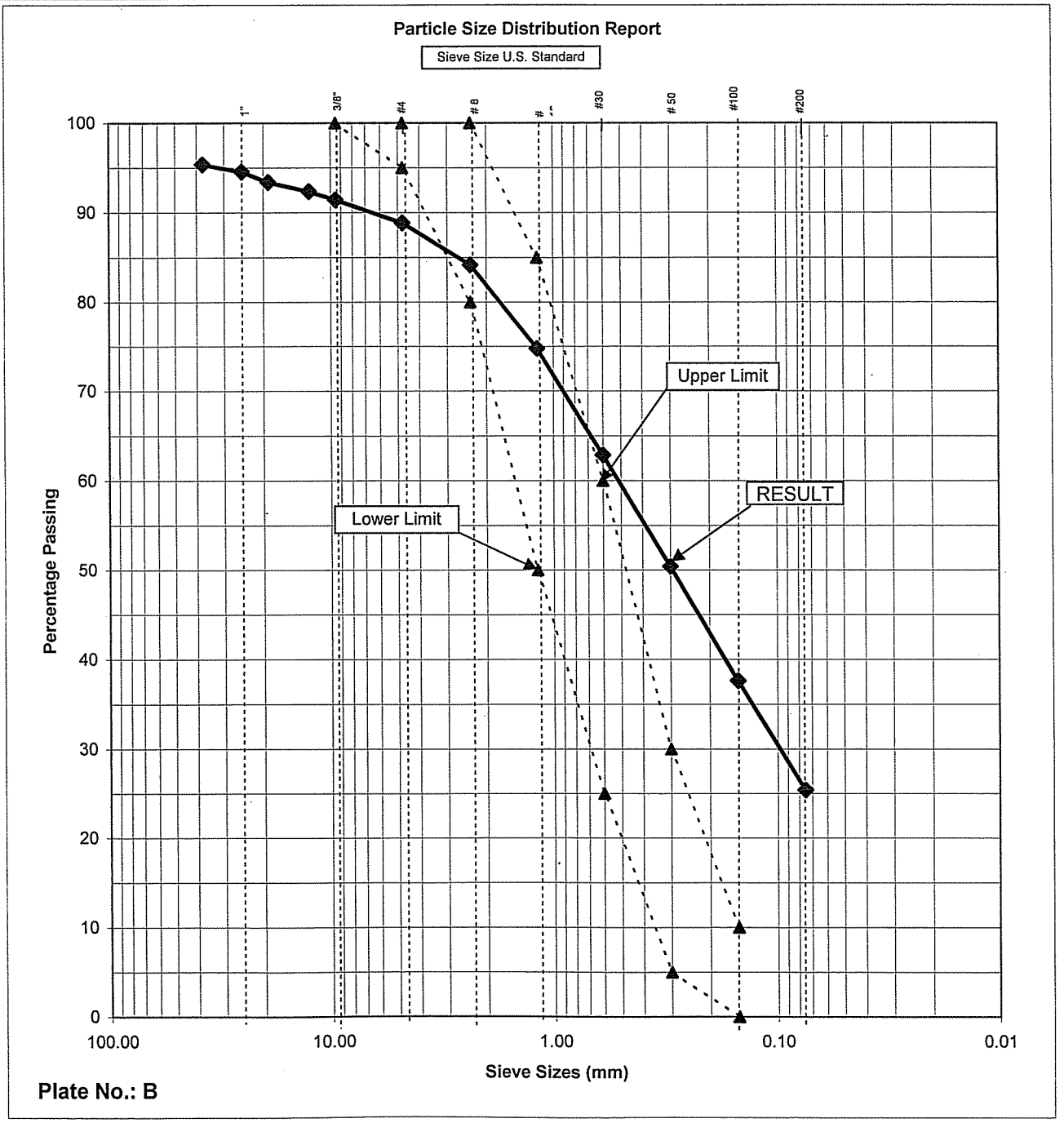


Plate No.: B

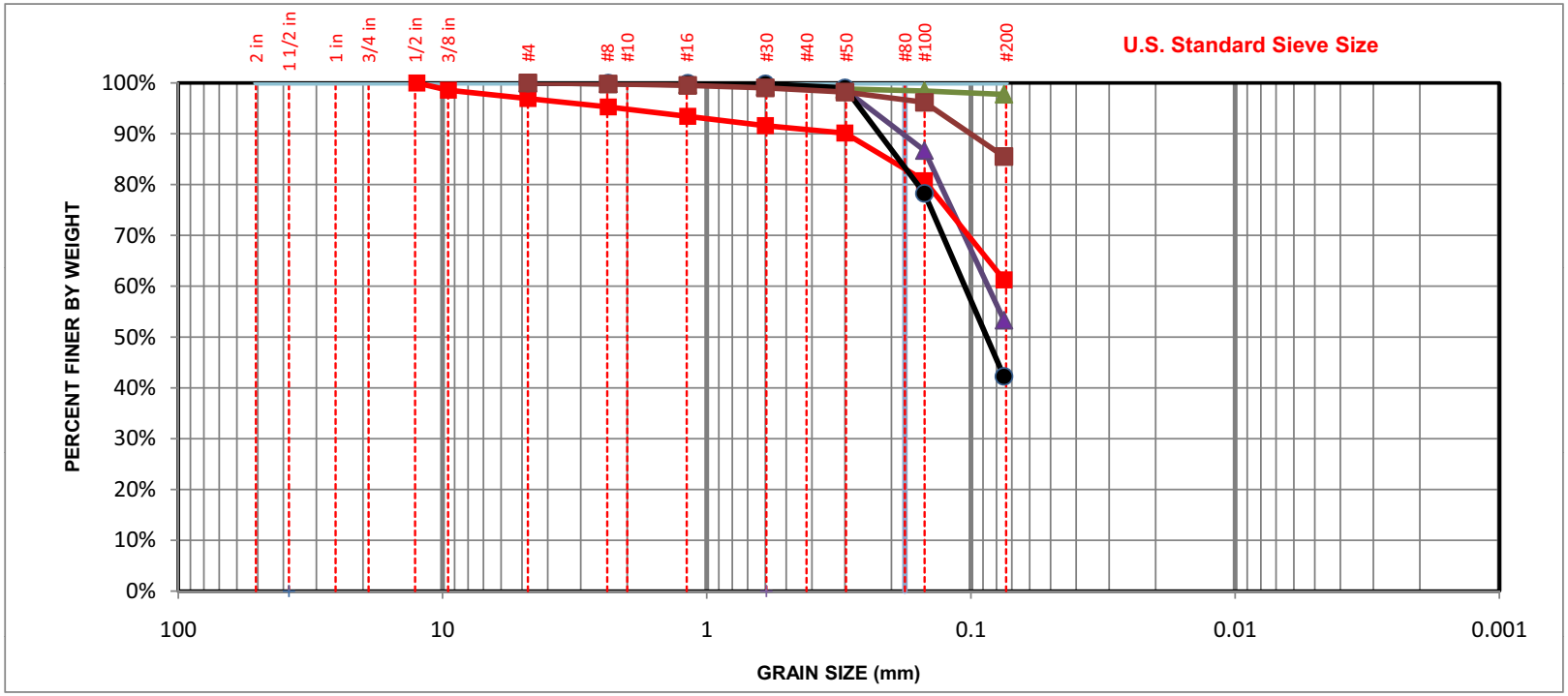
KFM GEOSCIENCE
1360 Valley Vista Drive
Diamond Bar, CA 91765
Phone (909) 860-5096

GRAIN SIZE DISTRIBUTION ANALYSIS

(ASTM C136/C117/D422)

Job Name:	LADPW Sedimentation Study	Tested By :	MN
Job Number:	BAS 11-58E	Date Completed:	June 17, 2011
Sampled By:	MS	Input By:	MN
Date Sampled:	June 9, 2011	Lab Number:	27

Sample Description: Samples from Devil's Gate; samples DG-1a, 1b, 2a, 2b and 3



	Sample #	Lab #	LL	PI	USCS	Gravel	Sand	Fines	2μ
●	DG-1a	27			SM	0.0%	57.7%	42.3%	
■	DG-1b	27	41	2	ML	0.0%	14.5%	85.5%	
▲	DG-2a	27	52	12	MH	0.0%	2.2%	97.8%	
▲	DG-2b	27			ML	0.1%	46.6%	53.3%	
■	DG-3	27			ML	3.1%	35.7%	61.3%	

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Diamond Bar, CA 91765
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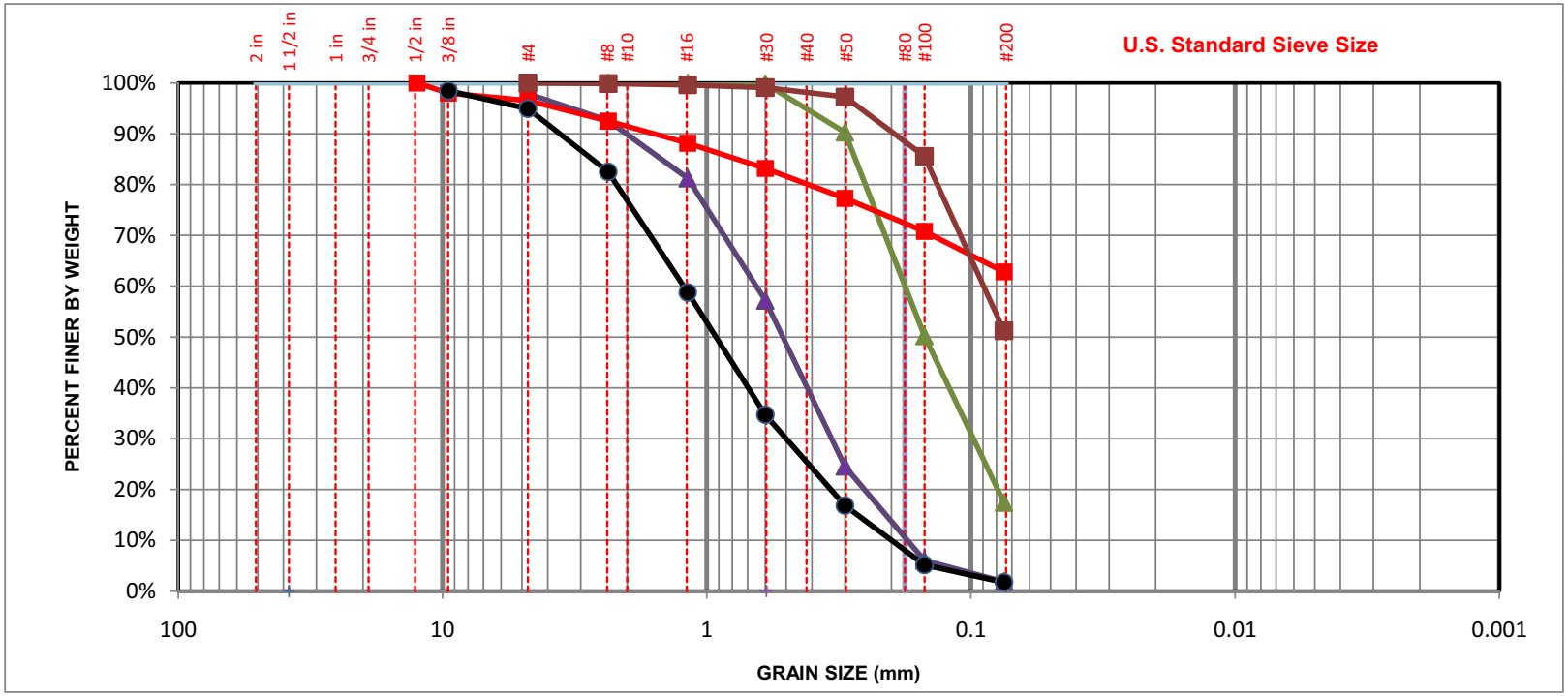
GRAIN SIZE DISTRIBUTION ANALYSIS

(ASTM C136/C117/D422)

Job Name:	LADPW Sedimentation Study	Tested By :	MN
Job Number:	BAS 11-58E	Date Completed:	June 17, 2011
Sampled By:	MS	Input By:	MN
Date Sampled:	June 9, 2011	Lab Number:	27

Sample Description: Samples from Devil's Gate; samples DG-4a, 5a, 5b, 6a and 6b



	Sample #	Lab #	LL	PI	USCS	Gravel	Sand	Fines	2μ
●	DG-4a	27			SP	5.1%	93.2%	1.7%	
■	DG-5a	27			ML	0.0%	48.8%	51.2%	
▲	DG-5b	27			SM	0.0%	82.6%	17.4%	
▲	DG-6a	27			SP	2.1%	96.0%	1.9%	
■	DG-6b	27		NP	ML	3.5%	33.7%	62.8%	

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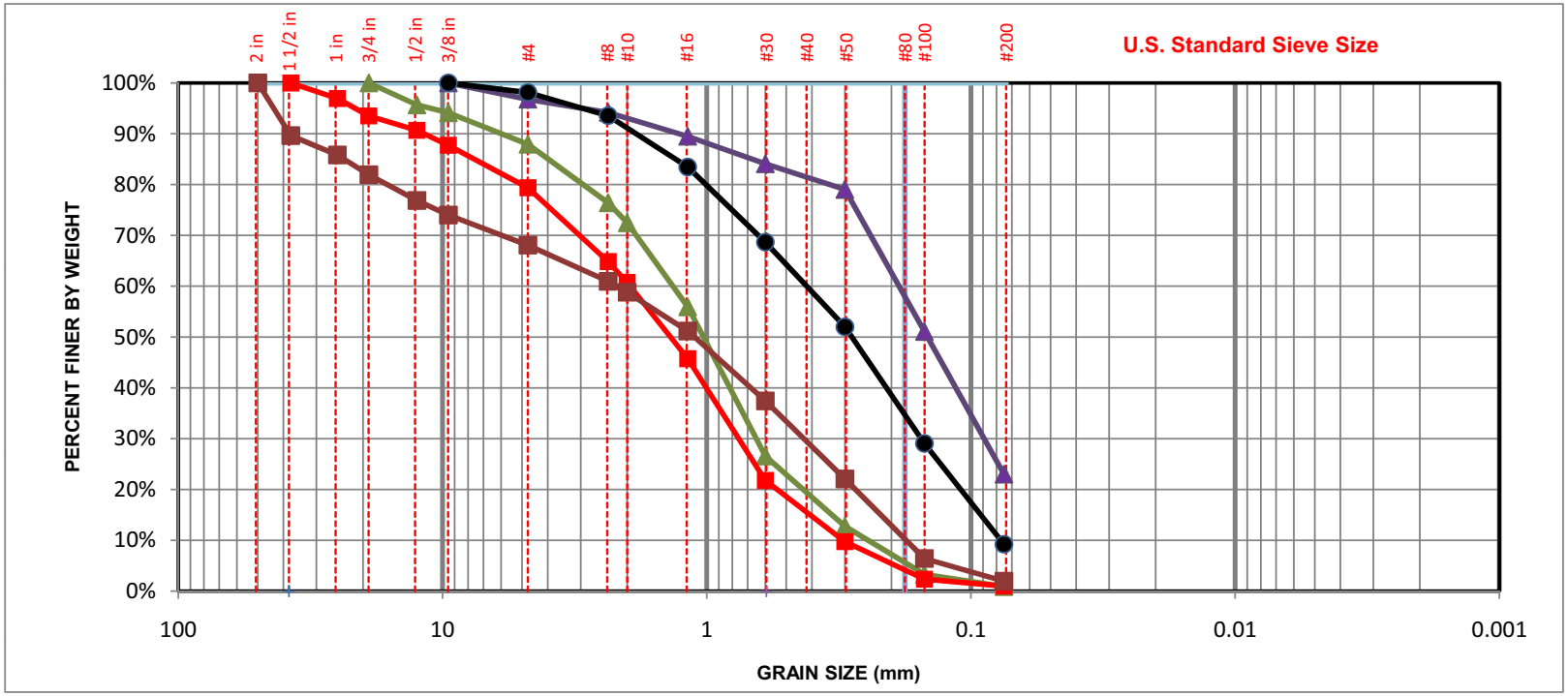
GRAIN SIZE DISTRIBUTION ANALYSIS

(ASTM C136/C117/D422)

Job Name:	LADPW Sedimentation Study	Tested By :	MN
Job Number:	BAS 11-58E	Date Completed:	June 17, 2011
Sampled By:	MS	Input By:	MN
Date Sampled:	June 9, 2011	Lab Number:	27

Sample Description: Samples from Devil's Gate; samples DG-7, 8, 9a, 9b and 10



	Sample #	Lab #	LL	PI	USCS	Gravel	Sand	Fines	2μ
●	DG-7	27			SP	1.9%	88.9%	9.2%	
■	DG-8	27			SP	31.9%	66.1%	1.9%	
▲	DG-9a	27			SP	12.1%	87.0%	0.9%	
▲	DG-9b	27			SM	3.2%	73.8%	23.0%	
■	DG-10	27			SP	20.6%	78.4%	1.0%	

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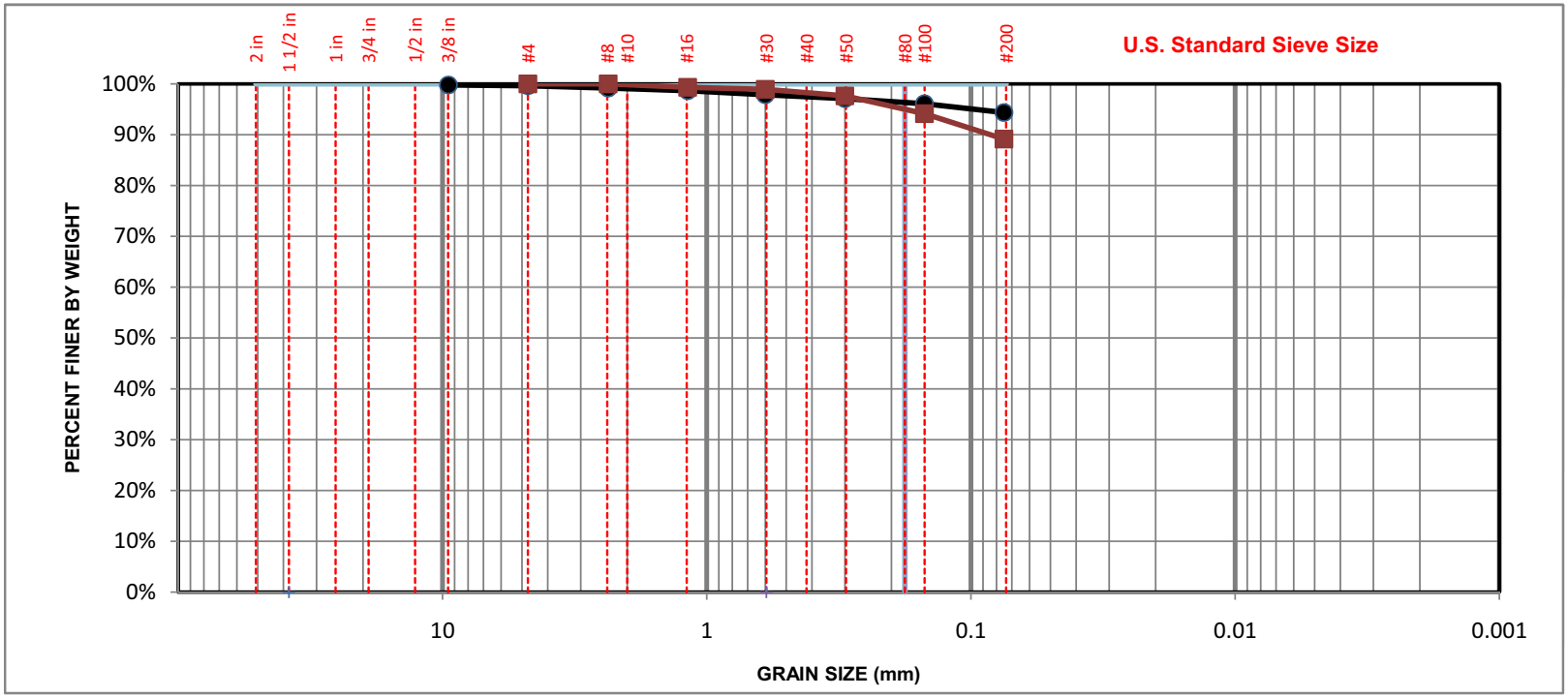
GRAIN SIZE DISTRIBUTION ANALYSIS

(ASTM C136/C117/D422)

Job Name:	LACDPW Sedimentation Study	Tested By :	MN
Job Number:	BAS 11-58E	Date Completed:	June 17, 2011
Sampled By:	MCS	Input By:	MN
Date Sampled:	June 9, 2011	Lab Number:	27

Sample Description: Samples from Devil's Gate; DG-11 and DG-12



	Sample #	Lab #	LL	PI	USCS	Gravel	Sand	Fines	2μ
●	DG-11	27	48	7	ML	0.4%	5.3%	94.4%	
■	DG-12	27	50	12	MH	0.0%	10.8%	89.2%	
▲									
▲									
■									

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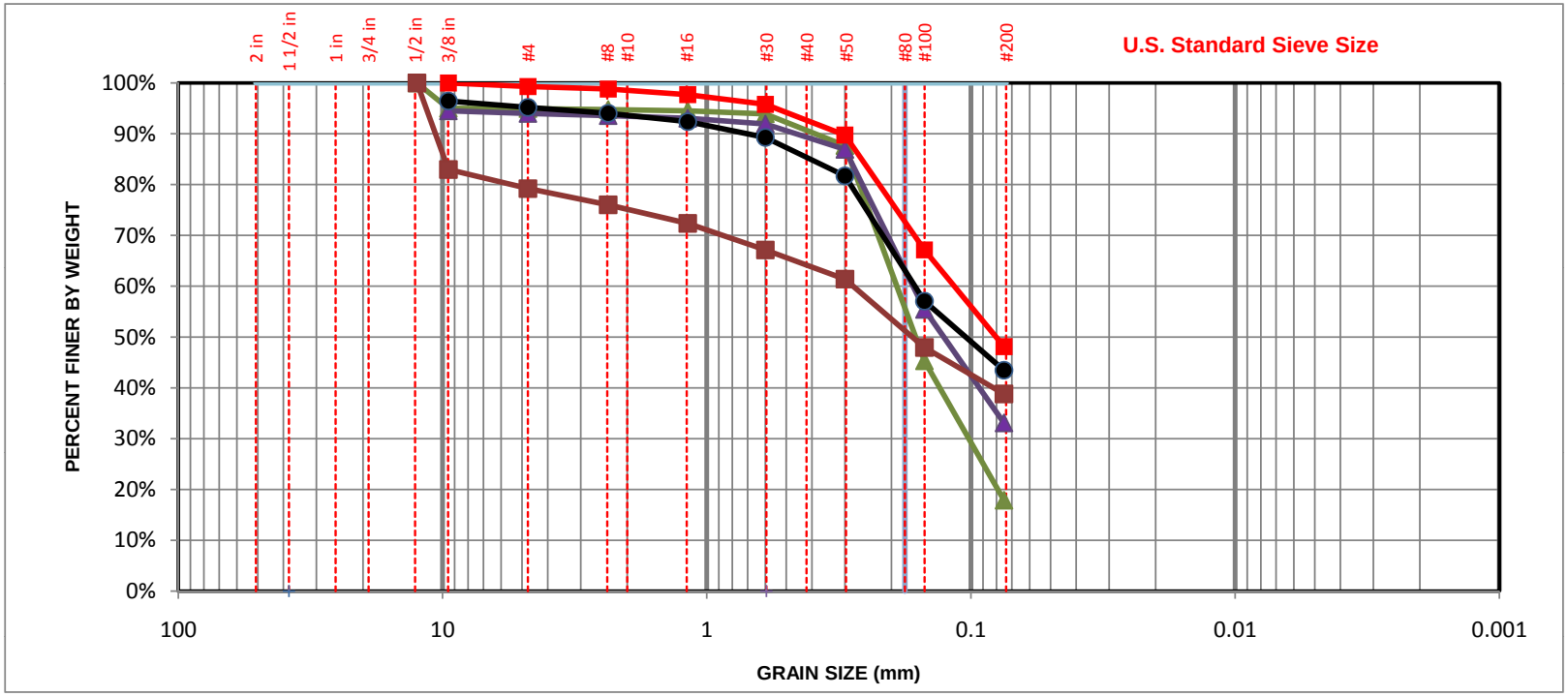
GRAIN SIZE DISTRIBUTION ANALYSIS

(ASTM C136/C117/D422)

Job Name:	LADPW Sedimentation Study	Tested By :	MN
Job Number:	BAS 11-58E	Date Completed:	June 17, 2011
Sampled By:	MS	Input By:	MN
Date Sampled:	June 9, 2011	Lab Number:	27

Sample Description: Samples from Santa Fe Dam, SF-1 to SF-5



	Sample #	Lab #	LL	PI	USCS	Gravel	Sand	Fines	2μ
●	SF-1	27			SM	4.8%	51.7%	43.5%	
■	SF-2	27			SM	20.8%	40.4%	38.8%	
▲	SF-3	27			SM	5.0%	77.1%	17.9%	
▲	SF-4	27			SM	6.0%	60.9%	33.1%	
■	SF-5	27			SM	0.7%	51.2%	48.1%	

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Diamond Bar, CA 91765
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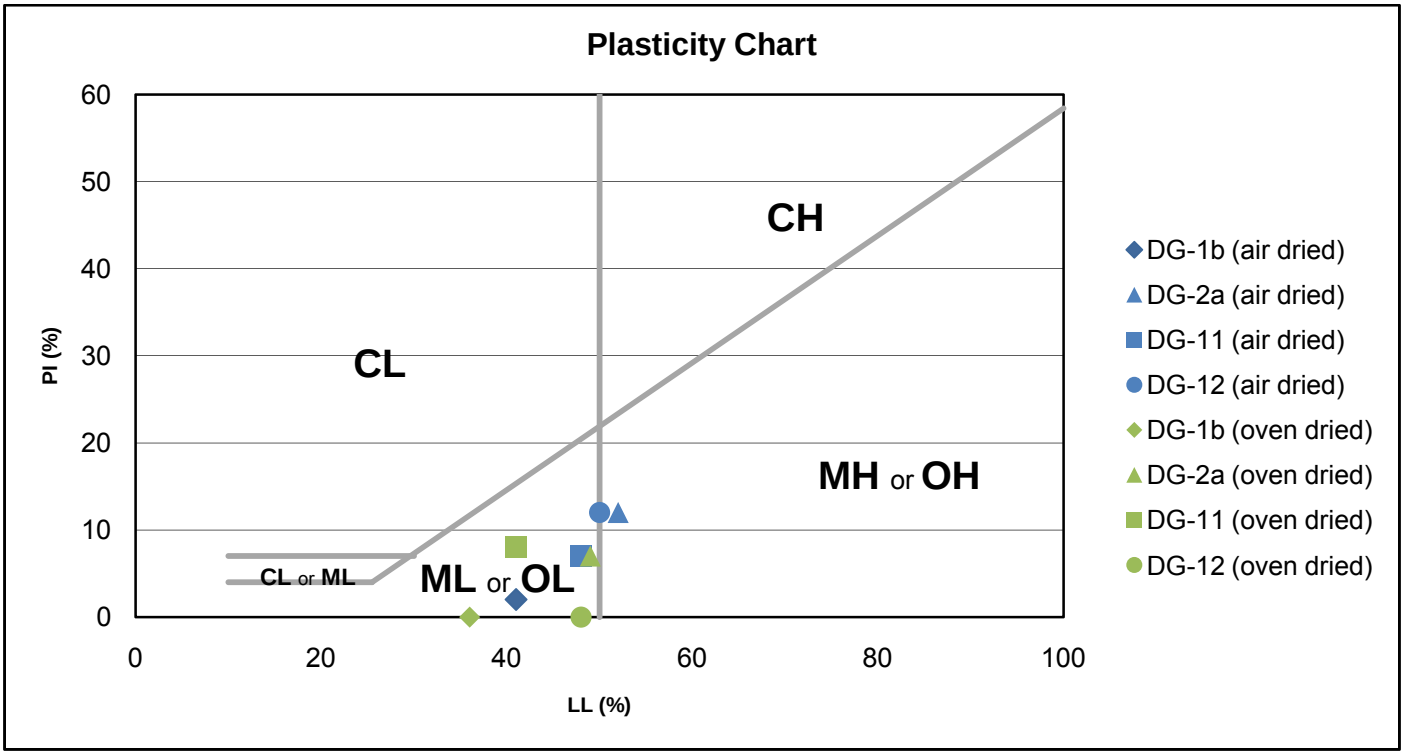
ATTERBERG LIMITS

ASTM D 4318

Job Name:	LACDPW Sed. Study	Tested By :	MN, JC
Job Number:	BAS 11-58E	Date Completed:	August 16, 2011
Sampled By:	MCS	Input By:	MN, JC
Date Sampled:	June 9, 2011	Lab Number:	27, 34

Sample ID	Liquid Limit	Plasticity Index	USCS Classification
DG-1b (air dried)	41	2	ML
DG-2a (air dried)	52	12	MH
DG-4b (air dried)	NP	NP	ML
DG-6b (air dried)	NP	NP	ML
DG-11 (air dried)	48	7	ML
DG-12 (air dried)	50	12	MH
DG-1b (oven dried)	36	0	ML
DG-2a (oven dried)	49	7	ML
DG-11 (oven dried)	41	8	ML
DG-12 (oven dried)	48	0	ML



SMITH-EMERY LABORATORIES
An Independent Commercial Testing Laboratory
781 E. Washington Boulevard - 2nd Floor Los Angeles, California 90021 ◆ (213) 745-5333 ◆ Fax (213) 749-7232

June 23, 2011

SEL File No.: 40126-1
SEL Report No.: G-11-8518

KFM GeoScience
1360 Valley Vista Drive
Diamond Bar, CA 91765

Attn: Mr. Michael Stojanoff

RE: LADPW Sedimentation Study
Los Angeles, California

Incompliance with the request by your authorized representative, Smith-Emery Laboratories has completed testing for the sediment samples for sand equivalent, organic impurities and organic matter in accordance with ASTM standard test method.

Test results are as follows:

REPORT OF TEST

Date Sample Received: 6/10/11 **Date Tested:** 6/21/11
Sampled By: Client

Sample I.D.	Test Method	Results
TP3 @ 3 – 12ft	ASTM D2974 Organic Matter	4.4
TP2 @ 5 – 11 ft	ASTM D2974 Organic Matter	2.5
TP3 @ 3 – 12 ft	ASTM C40 Organic Impurities	Darker Than Standard
TP2 @ 5 – 11 ft	ASTM C40 Organic Impurities	Darker Than Standard
TP3 @ 0 – 3 ft	ASTM D2419 Method A ave. of three	27
TP2 @ 5 – 11 ft	ASTM D2419 Method A ave. of three	25

Should you have any questions regarding the contents of this report, please call.

Respectfully submitted,
SMITH-EMERY GEOSERVICES

ANGELITO CABANILLA
Geotechnical Laboratory Manager
AC/ac
cc: 2-Addresse

SMITH-EMERY LABORATORIES
An Independent Commercial Testing Laboratory
781 E. Washington Boulevard - 2nd Floor Los Angeles, California 90021 ◆ (213) 745-5333 ◆ Fax (213) 749-7232

August 1, 2011

SEL File No.: 40126-1
SEL Report No.: G-11-8562

KFM GeoScience
1360 Valley Vista Drive
Diamond Bar, CA 91765

Attn: Mr. Michael Stojanoff

RE: LADPW Sedimentation Study
Los Angeles, California

Incompliance with the request by your authorized representative, Smith-Emery Laboratories has completed testing for the sediment samples for organic impurities and organic matter in accordance with ASTM standard test method.

Test results are as follows:

REPORT OF TEST

Date Sample Received: 7/27/11 **Date Tested:** 7/28/11
Sampled By: Client

Sample I.D.	ASTM D2974 Organic Matter		ASTM C40 Organic Impurities	
	As received Moisture Content (%)	Ash Content After 440°C	Organic Plate Color No.	Remarks
DG-2b @ 1.5 – 4.0ft	30.4	**4.6**	**5**	Darker Than Standard
DG-3 @ 0.0 – 3.0 ft	44.3	**11.9**	**5**	Darker Than Standard
DG-5b @ 2.0 – 4.0 ft	–	–	**5**	Darker Than Standard
DG-7 @ 0.0 – 1.5 ft	–	–	**4**	Darker Than Standard
DG-8 @ 0.0 – 1.5 ft	–	–	**3**	Standard

Should you have any questions regarding the contents of this report, please call.

Respectfully submitted,
SMITH-EMERY GEOSERVICES

ANGELITO CABANILLA
Geotechnical Laboratory Manager
AC/ac
cc: 2-Addresse

SMITH-EMERY LABORATORIES
An Independent Commercial Testing Laboratory
781 E. Washington Boulevard - 2nd Floor Los Angeles, California 90021 ◆ (213) 745-5333 ◆ Fax (213) 749-7232

August 2, 2011

SEL File No.: 40126-1
SEL Report No.: G-11-8568

KFM GeoScience
1360 Valley Vista Drive
Diamond Bar, CA 91765

Attn: Mr. Michael Stojanoff

RE: LADPW Sedimentation Study
Los Angeles, California

Incompliance with the request by your authorized representative, Smith-Emery Laboratories has completed testing for the sediment samples for sand equivalent in accordance with ASTM D 2419 standard dry method.

Test results are as follows:

REPORT OF TEST

Date Sample Received: 7/27/11 **Date Tested:** 8/1/11

Sampled By: Client

Sample I.D.	Test Method	Results
DG-5b @ 2.0 – 4.0ft	ASTM D2419 Method A ave. of three	**74**
DG-7 @ 0.0 – 1.5 ft	ASTM D2419 Method A ave. of three	**88**
DG-8 @ 0.0 – 1.5 ft	ASTM D2419 Method A ave. of three	**89**

Should you have any questions regarding the contents of this report, please call.

Respectfully submitted,
SMITH-EMERY GEOSERVICES

ANGELITO CABANILLA
Geotechnical Laboratory Manager
AC/ac
cc: 2-Addresse

SMITH-EMERY LABORATORIES
An Independent Commercial Testing Laboratory
781 E. Washington Boulevard - 2nd Floor Los Angeles, California 90021 ◆ (213) 745-5333 ◆ Fax (213) 749-7232

July 5, 2011

SEL File No.: 40126-1
SEL Report No.: G-11-8528

KFM GeoScience
1360 Valley Vista Drive
Diamond Bar, CA 91765

Attn: Mr. Michael Stojanoff

RE: LADPW Sedimentation Study
Los Angeles, California

Incompliance with the request by your authorized representative, Smith-Emery Laboratories has completed testing for the sediment samples for soundness test using sodium sulfate solution in accordance with ASTM standard test method.

Test results are as follows:

REPORT OF TEST

Date Sample Received: 6/10/11 **Date Tested:** 6/23/11

Sampled By: Client

Sample I.D.	Test Method	Results Loss after 5 cycles
TP2 @ 5 – 11 ft	ASTM C88 by Sodium Sulfate	**5**
TP3 @ 0 – 3 ft	ASTM C88 by Sodium Sulfate	**5**

Note: Sample tested are passing 3/8" and the calculated weighted losses are base from the original grading of samples as received per ASTM C88.

Should you have any questions regarding the contents of this report, please call.

Respectfully submitted,
SMITH-EMERY GEOSERVICES

ANGELITO CABANILLA
Geotechnical Laboratory Manager
AC/ac
cc: 2-Addresse

SMITH-EMERY LABORATORIES
An Independent Commercial Testing Laboratory
781 E. Washington Boulevard - 2nd Floor Los Angeles, California 90021 ◆ (213) 745-5333 ◆ Fax (213) 749-7232

August 12, 2011

SEL File No.: 40126-1
SEL Report No.: G-11-8580

KFM GeoScience
1360 Valley Vista Drive
Diamond Bar, CA 91765

Attn: Mr. Michael Stojanoff

RE: LADPW Sedimentation Study
Devil's Gate,Los Angeles, California

Incompliance with the request by your authorized representative, Smith-Emery Laboratories has completed testing for the sediment samples for soundness test using sodium sulfate solution in accordance with ASTM standard test method.

Test results are as follows:

REPORT OF TEST

Date Sample Received: 7/27/11 **Date Tested:** 8/1/11

Sampled By: Client

Sample I.D.	Test Method	Results Loss after 5 cycles
DG7 @ 0.0'– 1.5'	ASTM C88 by Sodium Sulfate (Fine)	**1**
DG8 @0.0'– 1.5'	ASTM C88 by Sodium Sulfate (Coarse)	**2**
DG8 @ 0.0'– 1.5'	ASTM C88 by Sodium Sulfate (Fine)	**2**

Note: Sample DG8 tested for both coarse and fine the calculated weighted losses are base from the original grading of samples as received per ASTM C88. Sieve analysis data provided by client per ASTM C136.

Should you have any questions regarding the contents of this report, please call.

Respectfully submitted,
SMITH-EMERY GEOSERVICES

ANGELITO CABANILLA
Geotechnical Laboratory Manager
AC/ac
cc: 2-Addresse