APPENDICIES

APPENDIX A

RMAC Meeting Summary
November 4, 2009

Bryan A. Stirrat & Associates
Civil And Environmental Engineers

CITY OF SAN DIEGO - LONG-TERM RESOURCE MANAGEMENT OPTIONS (LRMO) STRATEGIC PLAN

http://www.sandiego.gov/environmental-services/geninfo/lrmo.html

RESOURCE MANAGEMENT ADVISORY COMMITTEE (RMAC)

PHASE II First Meeting

(Note: New location)
City of San Diego - Environmental Services Dept., 2nd Floor
9601 Ridgehaven Court, San Diego CA 92123

Wednesday, November 4, 2009
2:30 to 5:00 PM

AGENDA

I. Welcome/Introductions

II. City/ Environmental Services Department Update
   a. Franchise Haulers Meetings
   b. Recycle/Zero Waste Program Updates
   c. What Private Companies are doing in the region

III. Phase I Report Summary
(Presentation to Natural Resources & Culture Committee)

IV. Phase II
   - Why modified?
   - What the Scope of Work involves.

V. Phase II Evaluation Criteria and System Configuration Discussion

VI. Q & A

City of San Diego Long-term Resource Management Options (LRMO)
Strategic Plan - Phase II
Resource Management Advisory Committee
Environmental Services Department, Ridgehaven Court, San Diego, CA 92123
2nd Floor
Wednesday, November 4, 2009, 2:30 – 5:00 pm

Meeting Summary

RMAC Members Present:
Richard Anthony, San Diego County Integrated Waste Management/Citizens Advisory Committee
Mike McDade, San Diego County Disposal Assocation
Sylvia Castillo, City of San Diego Environmental Services Department (ESD)
Andrea Eaton, City of San Diego Council District 7
Robert Epler, Environmental Services Department
Beryl Flom, League of Women Voters San Diego
Barbara Lamb, City of San Diego, CEO/Business Office
Amy Harris on behalf of Lani Lutar, San Diego County Taxpayers Association
Leslie McLaughlin, Navy Base San Diego
Brian Henry on behalf of Rochelle Monroe, ESD
Alan Pentico, San Diego County Apartment Association
Jacquie Adams on behalf of William Prinz, City of San Diego Solid Waste Local Enforcement Agency

RMAC Members Absent
Faith Buyuksonmez, San Diego State University, Dept of Civil and Envr Studies
Jamie Fox-Rice, City of San Diego, Council District 3
Lynn France, City of Chula Vista, Public Works Dept

Project Team Members Present:
Lewis Michaelson, Katz and Associates
Sonia Nasser, Bryan A. Stirrat and Associates, a Tetra Tech Company (BAS)
Cesar Leon, BAS
Chris Gonaver, ESD
Steven Grealy, ESD
Kip Sturdevan, ESD

Public
Keith Battle, Public Policy Partners
Renee Robertson, ESD
Lawrence Chapman, Taman
Carlie Peck, Solana Center

Introduction:
Lewis Michaelson introduced himself as the neutral facilitator for the Resource Management Advisory Committee (RMAC) process. Each RMAC member and the remaining audience were asked to introduce

themselves and the organization they represented. Mr. Michaelson then reviewed the agenda for the meeting and introduced Chris Gonaver.

Environmental Services Department Update:
Chris Gonaver, Director of ESD, thanked the committee members for attending and began by providing a brief update. Mr. Gonaver discussed the subcommittees that had been formed with the Franchise Haulers to share and exchange information on Collection Services Equipment, Maintenance and Purchasing costs and Collection Services Operational Practices.
Stephen Grealy provided an update on several aspects of disposal and diversion, including the decline of waste volume disposed at Miramar Landfill, the effects of the City's Recycling and Construction & Demolition (C&D) Ordinances, AB939 fee revenue and curbside recycling commodities sales revenues. He also discussed the new C&D processing facility in El Cajon, a pilot asphalt processing facility and the expanded area for greenery at Miramar. Stephen also mentioned the new recycling bag developed for apartment residents in conjunction with the San Diego County Apartment Association. Alan Pentico mentioned that as apartment units come on-line they look for every press opportunity to highlight and showcase the new program. Stephen later brought down and showed what the colorful, heavy duty recycling bag looks like.

Q. How much food waste is being composted along with the green waste at Miramar?
A: Current 2500 tons per year are being composted and the source of the material is from Sea World, Petco Park and other restaurants.

Q: What caused such large dip in the curbside recycling commodities in earlier years?
A: The graph reflects net revenue and that particular year accounted for program costs such as bin expenses and the equipment to collect the recyclables?
Q: Can the use of recycling bin colors be standardized across the region?
A: Yes, the City and the other hauler's did not coordinate the color of the recycling bins, however it is not currently possible to make all haulers have the same color RECYCLING BIN, more education on the use of the recycling bins however is possible.

Q: What is the status of the ESD Business Process Reengineering (BPR) effort?
A: The ESD BPR has been implemented and resulted in a 16% full time employee (FTE) reduction which helped ESD improve its efficiency and effectiveness.

Q: How much additional composting will the City be able to do with the expanded Miramar Greenery facility?
A: The facility processes approximately 2,000 – 2,500 tons currently and with the expansion may be able to double its output.

Phase I Report Overview:
Sylvia Castillo provided a brief overview of the work completed in Phase I of the LRMO Strategic Plan. Phase I found that the West Miramar Landfill would reach capacity in 2019. The RMAC proposed 39 options to be carried forward to Phase II of the project, to be considered as possible components of a future system for resource management.

Q: Won't the economy impact the tonnage received at Miramar which would impact the predicted closure date of the landfill?

A: Yes, projecting disposal demand and the date the landfill will reach capacity will be a moving target. Phase II of the effort will consider economic factors used by the City to appropriately project tonnage and financial impacts.

Q: Why is the regional capacity listed as 2030 while Phase I points out a capacity of 2019?
A: The regional capacity is projected to be to year 2030 while the City-owned, Miramar Landfill is projected to have a capacity to year 2019. The regional capacity takes into account landfills outside of the City's system (e.g. Sycamore and Otay)

Q: Will there be a paradigm shift in financing following the shift from landfilling to zero-waste?
A: Funding allocations will most likely not strictly be allocated per the paradigm shift. Costs of financing infrastructure facilities (material recovery facilities, landfills) are substantially higher that funding programs such as education.

Q: Were the 39 options listed the RMAC's suggestions? Are they ranked in order?
A: Yes, the list was developed based on RMAC's input and no, the list does not rank the options. Any option that received a screening value of 3 or higher by the RMAC and the project team was included in the list of options that should be carried forward into Phase II. However their screening values did not carry forward, in Phase II those options would be evaluated anew as part of system configurations, not stand alone options

Q: Can we add to the list of options?
A: If a significant option was missed or is needed those can be considered. For example in Phase I the expansion of West Miramar was not anticipated, however it is now of the options that will be evaluated in Phase II.

Phase II Scope of Work Revised
:
Barbara Lamb from the Mayor's Business Office provided an overview of why the Phase II Scope of Work which has been modified to provide a greater focus on financial analysis and the cost of options available to pursue various resource management strategies. The RMAC will continue to provide valuable input and feedback during Phase II of the LRMO strategic planning process.

Q: Does the City and ESD specifically have the budget for implementing the strategies suggested by the RMAC?
A: ESD is not planning on receiving any new dollars for implementation, but different financing options will be explored in Phase II of this effort.

Q: Has the City looked at new concepts such as 'pay as you throw'?
A: A committee formed by Council will be looking into new revenues options for the City. Phase II of this effort will be looking at different financing options for different strategies. It will be focused on the big picture questions on how we move forward in investing, building, hauling, etc.

Phase II Scope of Work Elements

Sonia Nasser provided an overview of the various tasks the Project Team will be undertaking during Phase II, such as updating the demand and capacity models, costing and providing timing for various infrastructure options. Then the team will develop various system configurations for which financial plans to 2045 will be modeled. The year 2045 was selected because that is the year the land lease for Miramar expires.

Evaluation Criteria & System Configurations:
Lewis Michaelson provided an overview of evaluation criteria and system configurations. A system configuration will include different resource management options, programs, and policies designed to meet the City's waste management needs. The evaluation criteria will be used to rank each system configuration and to aid in the decision making process. It is important to note that the highest ranked configuration will not always be the best choice moving forward. Other externalities will play a role in the decision making process. In order to develop a weighted score for each criterion, each RMAC member was asked to distribute 100 points across six different evaluation criteria (financial, technical, environmental, capacity optimization, and sustainability). The results were collected and will be tabulated and shared with the RMAC as a follow up to this meeting.

Q: Who developed the list of criteria? Do the criteria make sense and are they comparable?
A: The RMAC developed the evaluation criteria in Phase I of this effort. Individual criteria are not meant to be comparable; they are intended to take into account and reflect varying perspectives and preferences.

After the criteria weighting exercise was completed, RMAC members were asked for their feedback on what types of system configurations they thought should be formulated and evaluated in Phase II. The RMAC provided a number of suggestions on various combinations of policies, programs and facilities. Some suggestions emphasized zero waste programs, additional organics collection, some expanding capacity at Miramar, and some emphasized diversion and other more traditional approaches. Based on this feedback, ESD and the consultant team will generate representative system configurations and share with the RMAC for their review and feedback, before beginning their technical and financial analysis.

Q: What other models (system configurations) are being used currently? Can we examine what other regions are doing?
A: Phase I of the effort looked into best practices in resource management implemented in other regions. Phase II will look at the options the RMAC developed and group them into different system configurations to ultimately develop a preferred strategy. Yes there are other entities developing or that have zero waste programs however the City of San Diego is unique because of its constraints from the People's Ordinance (single family residents do not pay for trash collection) and Proposition H (limitation on incineration of waste to 500 tons per day and siting criteria restrictions).

Q: There are two main issues that the City has to deal with. One being the People's Ordinance and the other is Proposition H. Should we develop configurations with these limitations in mind?
A: The system configurations will consider constraints such as these and the analysis will allow the RMAC to evaluate whether it would be worth the effort to pursue changes in such ordinances. For example, the comparison of system configurations would enable us to understand if the benefits to the system would be great enough to warrant pursuing the difficult political challenge of seeking change to the People's Ordinance or Proposition H. Options should not be thrown out based on restrictions but evaluated to determine if the options are feasible and worthwhile.

Q: How will externalities in the future impact our decision making now? More specifically, how will certain federal fiscal and regulatory policies impact the way things are done in the future?

A: Phase II of the project will consider projections that the City currently uses in its financial reports to ensure consistency. To a certain extent, the model that is developed for the City can be modified to revise projections based on future policies, programs, and procedures.

Conclusion:
Lewis Michaelson thanked everyone for attending and providing input. He also stated that the next meeting has not been scheduled, but would not occur before the end of the year. In the meantime, ESD and the consultant team would be compiling the criteria weighting exercise and system configuration inputs from the RMAC and providing them in draft form to the RMAC for feedback. Also, from this point forward,,Barbara Lamb from the Business Office will be the primary contact for RMAC members if they have questions or comments during Phase II. Barbara's e-mail address is: BLamb@sandiego.gov.

APPENDIX B

NORTH MIRAMAR LANDFILL RECLAMATION EVALUATION

APPENDIX B

LRMOSP PHASE II
NORTH MIRAMAR LANDFILL RECLAMATION EVALUATION

1.1 NORTH MIRAMAR LANDFILL RECLAMATION

The purpose of this appendix is to present the results of Bryan A. Stirrat & Associates' (BAS) technical and economic evaluation of the North Miramar Landfill (NML) reclamation project. This work was completed as part of Phase II of the City of San Diego's (City) Long-term Resource Management Options Strategic Planning (LRMOSP) process.

The scope of the Phase II technical and economic evaluation for the NML reclamation project was to:

- Prepare conceptual development plans for the reclamation of the NML.
- Prepare a range of preliminary cost estimates and timelines to complete the permitting, design, pilot-study and full-scale implementation of the reclamation of the NML.
- Provide timing and costs for the reclamation project to be used in the financial analysis.

BAS prepared the "Reclamation Options Study, North Miramar Landfill, dated July 2008" as part of Phase I of the City's LRMOSP process. This report

- Characterized the type and estimated the quantity of waste to be reclaimed based on available data;
- Summarized existing and emerging technologies or methods for landfill reclamation;
- Narrowed the list of options using established criteria that is general and specific to the North Miramar site and City goals.
- Provided options to City's Environmental Services Department (ESD) for a future pilot project;
- Provided recommendations for the location of a pilot project on the landfill; and

- Provided draft performance criteria for the pilot project to be used in determining feasibility.

BAS' recommendations in the reclamation study were the genesis for this technical and economic evaluation of the NML reclamation.

1.1.1 NORTH MIRAMAR LANDFILL DESCRIPTION

The NML is bound to the north by the Miramar Naval Air Station, Highway 163 to the east, the active West Miramar Landfill (WML) to the west and State Route 52 to the south. The active WML operated by the City has a projected closure date of 2022 based on the site's permitted remaining capacity and assumptions for future tonnage projections in Phase II of the LRMOSP. The 250-acre landfill site is located within approximately 285 acres of federal land leased from the United States Navy on the Marine Corps Air Station (MCAS).

The site was operated from 1973 to 1982 and the material permitted for disposal at the site included residential, commercial, construction and demolition waste and tires.

The NML is unlined, does not have a leachate collection system, and has a landfill gas (LFG) collection system. The Miramar Landfills in total (West, South and North Miramar) have approximately 200 extraction wells, 73,000 feet of piping, automatic condensate handling system, 3 blowers, 2 flares and a gas-to-energy plant operated by Fortistar Methane.

There are no known impacts to ground water beneath the landfill site based on the site's ongoing groundwater monitoring program results. The final cover has not yet been placed over the NML surface.

1.1.2 GOALS OF RECLAMATION PROJECT

The goals of the reclamation project for the NML include, but are not limited to, the following:

1. Recover soil for developmental and operational use at the Miramar landfills;

2. Recover and sell marketable materials (i.e., ferrous and non-ferrous metals, glass, electronic goods, etc.);
3. Utilize a conversion technology (i.e., plasma gasification) to generate energy from the excavated wastes that are not otherwise marketable; and
4. Reclaim valuable land for re-use as a potential new landfill, in portions or in its entirety, by excavating the bottom of the existing landfill to gain valuable cover soil and additional capacity and line the landfill for renewed refuse disposal.

1.1.3 REGULATORY STATUS

CalRecycle's, formerly the California Integrated Waste Management Board (CIWMB), Solid Waste Information System (SWIS) number for the NML is 37-CR-0103 and its Waste Discharge Identification Number is 9 000 000 727. The site was issued Waste Discharge Requirements for post-closure maintenance and a Monitoring and Reporting Program (M&RP) from the California Regional Water Quality Control Board – San Diego Region (SDRWQCB) under Order No. 96-15 which is still active.

The NML is currently classified as an inactive landfill and is monitored and maintained by ESD. Revisions to the M&RP No. 96-15 were submitted to the SDRWQCB on January 30, 1997, and subsequent requests for modifications in the M&RP have been approved by the SDRWQCB to address changes to the ground water monitoring network, sampling methods (e.g. low-flow sampling methods), and laboratory analytical methods.

A certified, approved final cover has not been constructed at the NML.

1.1.4 SITE OPERATIONS

The NML was developed by filling two southwest trending tributaries to San Clemente Canyon. Landfill operations were described in the 1977 Solid Waste Facility Permit as follows:

"Normally, all the cells of one lift are completed prior to beginning the next higher lift. The lift height may vary from eight to twelve feet. Minimum daily cover for each cell is six inches. However, this cover is usually increased to about eighteen inches when the next higher lift is started to ensure a stable surface for the operation of heavy collection vehicles. The slope of the front working face is about 4:1. Compaction of the refuse is achieved by spreading it up the slope in layers about twelve inches thick and running the tractors over each layer a number of times. The final earth cover over the landfill is a minimum of two feet for the top surface and three feet for the 3:1 final slopes. "

1.1.5 WASTE CHARACTERIZATION

The CIWMB completed a composition study of the refuse disposed at the NML in 1977 and included the information in the Solid Waste Facility Permit. The composition study characterized the incoming waste as consisting of approximately 47% greenwaste (i.e., yard trimmings, wood, etc.), 34% paper products, 4% metals, 3.5% glass, 2% plastics and rubber, and the remainder was mixed waste, garbage, clothing, etc.

Additionally, general waste characterization data for the NML was obtained from a report entitled, "Privatization/Miramar Cogeneration & LFG Project, SCS Engineers, 1996". The reported waste characterization was based on information gathered during the installation of landfill gas wells at the NML. During that project, 67 borings were drilled by San Diego Drilling and logged by SCS Engineers for a landfill gas control system that was installed at that time.

The following types of materials were found in the borings: paper, yard waste, plastic, wood, cardboard, soil, newsprint, glass, metal, textile, rubber tires, food waste, fiberglass, plywood, brick, Styrofoam, foam rubber, car batteries, and demolition debris. There was no description regarding relative quantities of waste encountered.

The refuse was overall found to be very dry, however, in some locations was slightly moist. No known hazardous materials, other than in household quantities, are suspected to have been disposed of at the site.

1.1.6 WASTE VOLUMES

The NML was developed by filling two southwest trending tributary canyons of the San Clemente Canyon. BAS assumed that the canyons were not modified prior to filling and thus were filled from their base elevation of approximately 340 feet above mean sea level (AMSL) to a maximum elevation of 420 feet AMSL. Subsequently, the City placed approximately 1.5 to 48 feet of additional soil on the landfill deck to an elevation of 465 feet AMSL. The site was closed for disposal operations in 1982.

Based on the depth of refuse for each of the 67 gas borings that were drilled in 1996, refuse depths vary from 12 to 90 feet below ground surface. Using this data, BAS estimates a total in-place volume of refuse, daily cover and intermediate cover soil of approximately 11.8 million cubic yards (mcy). Based on the boring logs, approximately 2.8 million cy of soil cover overlies the waste. The cover soil consists primarily of silty sand and sand with gravel and cobbles.

1.1.7 PREVIOUS RECLAMATION PROJECTS

BAS reviewed published literature on previous reclamation projects completed across the country during the past 20 years. The most comprehensive discussion is presented by Innovative Waste Consulting Services, LLC who prepared a study entitled "Landfill Reclamation Demonstration Project, Perdido Landfill, Escambia County, dated June 2009" for the Florida Department of Environmental Protection as part of a landfill reclamation project for the Perdido Landfill.

The report provides an overview of twelve (12) previous reclamation projects ranging in size from 40,000 cy to over 2.1 million cy. BAS identified select projects that span a range of sizes, costs, production rates, and reclamation goals which are presented below.

To date, one of the largest landfill reclamation projects completed is the Clovis Landfill which relocated approximately 2.5 million cy of waste. The reclamation of the NML would be approximately 3.7 times larger, however, the experiences at even the smallest reclamation projects are useful in evaluating feasibility for the NML reclamation project.

LARGER PROJECTS

Clovis Landfill - Clovis, California

The Clovis Landfill reclamation project involved excavating and processing over 2.3 million cy of waste from the unlined landfill. The goals of the project were to address groundwater contamination, recover airspace and soil for cover needs. The City originally planned on a production rate of approximately 4,500 cy/day, however, over the life of the project a sustainable rate of only 1,300 cy/day was realized. The annual excavation rate was only 200,000 cy per year since the waste was only excavated during 60% of the working days. Most of the down time was associated with processing wet waste during the winter months during which most of the annual rainfall occurs. Towards the end of the rainy season, waste excavation would be delayed 2 weeks following rain events. The 12-acre working face and no daily cover requirements contributed to this situation. The processing operation recovers approximately 60% of the excavated volume as soil, the remaining volume is waste and disposed of in a lined cell. The unit cost for their current operation is reported at $5.10/cy.

Wynadot County Environmental Sanitary Landfill - Carey, Ohio

The Wyandot County Environmental Sanitary Landfill has a permitted disposal area of approximately 188 acres and consists of lined and unlined units. Contaminated groundwater was detected in the vicinity of the landfill and the Ohio Environmental Protection Agency mandated that the site owner relocate the waste from the unlined units to the lined units. At the time of preparation of the Perdido report, approximately 1.4 million cy of waste was relocated at a rate of approximately 300,000 cy per year (an average of approximately 1000 cy/day assuming a 300 day per year operation) cost of approximately $4 per cy. The waste was not processed following excavation.

Dean Forest Landfill – Savannah, Georgia

The Dean Forest Landfill located in the City of Savannah, Georgia relocated approximately 650,000 cy of waste as part of a landfill expansion and corrective action for the unlined portion of the landfill. The facility was listed under the State of Georgia's Hazardous Site Response Act for cadmium impacted groundwater. The City decided to relocate the waste as part of their corrective action and received a $2 million grant to implement the corrective action. The waste was only relocated (no screening) at a maximum rate of up to 7,000 cy/day. However, this rate was not sustained as the project took approximately 9 years to complete.

Pike Station Landfill – Waverly, Ohio

The Pike Sanitation Landfill reclamation involved the relocation (no processing) of between 700,000 to 800,000 cy of waste from a 40-acre unlined unit at a rate of approximately 40,000 cy per month. The unlined unit was in the middle of a 125-acre lined expansion. The waste was excavated from the months of November to March to minimize odors. The project commenced in 1996 and was completed in 2000.

Shawano County Landfill – Shawano County, Wisconsin

The Shawano County Landfill reclamation project relocated (no processing) between 300,000 to 400,000 cy waste at an approximate cost of $3/cy. The waste was relocated during the winter months to minimize odor, however, they were unable to process frozen waste. The waste was relocated to reduce off-site leachate treatment costs.

Frey Farm Landfill

The Frey Farm Landfill reclamation project excavated and processed between 300,000 to 400,000 cy of waste from a lined cell to supplement the feedstock of an existing waste-to-energy plant. Approximately 41% of the excavated volume was soil. At the end of the project in 1996, the project provided a net revenue of over $13 per ton of excavated waste to the County.

Central Disposal Systems Landfill – Lake Mills, Iowa

The Central Disposal Systems Landfill reclamation relocated (no processing) approximately 250,000 cy of waste from a 10-acre unlined cell at a rate between 1000 to 1500 cy/day. The landfill was reclaimed to recover the airspace and avoid potential future environmental liabilities associated with the unlined cell.

Naples Landfill – Collier County, Florida

The Naples Landfill reclamation project was for a 33-acre unlined cell that posed a groundwater contamination threat. The project was originally intended to decrease closure costs, reduce the risk of groundwater contamination, burn recovered combustible waste in a proposed waste-to-energy plant, recover soil for daily cover needs, and recover recyclable materials. Unfortunately, the waste-to-energy plant was never built and the recovered recyclables required extensive processing following excavation to upgrade the quality for sale and was abandoned. The project was only successful in recovering soil (40 to 60% by weight). Ultimately, the County only excavated and processed the waste when daily cover was needed as it was less expensive than importing cover materials.

Former Cal-Compact Landfill – being developed as Boulevards at South Bay Project, Carson, California

BAS/Tetra Tech are engineers for a 152-acre commercial/residential development on the former Cal-Compact Landfill. As part of that project large amounts of previously disposed waste required excavation and re-disposal on site (in 2009) to achieve the needed grading for the development. Because the Cal-Compact Landfill is a former hazardous waste site on the California Superfund List, the waste excavation/relocation elements are subject to extensive regulatory review and permitting. Although this project does not involve sorting and recycling of waste, it is valuable to include this project in this review to reflect the operational, regulatory, and monitoring elements of a large waste excavation/re-disposal operation, as follows:

- Tetra Tech obtained an AQMD Rule 1150 permit obtained for multiple waste excavation locations on site, each with a maximum open area of 500 sf each. Careful staging of the work allows the open working face in both the excavation and disposal areas to be maintained within this limit, with adjacent areas covered by temporary soil, plastic, or foam cover.
- As of June 2010, approximately 250,000 cubic yards of waste has been excavated and re-disposed, since the beginning of 2009 write the majority of excavation occurring over four months in early 2009.
- Daily rates of waste excavation and relocation were typically 3,000 cy per day per operational area (2 areas), using one CAT excavator and three CAT 657 scrapers in the excavation area and a bulldozer and compactor in the re-disposal area. Water trucks are also used and a foam machine is standing by. Two types of foam are on hand: Type AC645 water-based foam that is effective for approximately two hours, and Type AC904 latex-based foam that is effective for approximately three days.
- The operation is conducted as follows: The waste is excavated by the excavator and top-loaded into the scrapers. The scrapers drop the waste in one of three waste re-disposal areas by bottom dump in a tightly controlled area, where it is re-shaped by the bulldozer and compacted with the compactor. Water trucks wet the waste at both the excavation and re-disposal sites and along the scraper route for dust, emissions, and odor control. The waste in the re-disposal area is immediately covered with 6 inches of soil to control emissions. On a few occasions, the foam rig was employed to control emissions at the excavation site.
- The operation is monitored for air emissions and dust emissions by both manned and un-manned instrumentation. Weather stations provide wind speed and direction.

1.1.8 SUMMARY

A summary of the various landfill reclamation projects discussed above as well as others presented in the Perdido report are outlined in tables prepared and submitted to ESD. As can be seen, the daily production rates are very similar and range between 1000 to 1500 cy per day with the exception of the project in Savannah, Georgia which achieved a rate of up to 7,000 cy per day (with no screening). However, as discussed in the Clovis Landfill reclamation case study, the actual annual production rates vary considerably and when evaluated on a daily basis are less than the actual reported daily rate. This is due to operational inefficiencies, down time due to equipment break downs, maintenance, and weather.

The common equipment spread for these projects consisted of an excavator or two (e.g., CAT 345s), a trommel screen if the material was to be processed, and off-road (e.g., CAT 740) haul trucks. It appears that only one trommel screen was used at a time. Higher production rates would be expected if multiple equipment spreads were used. For instance, two equipment spreads (i.e, 4 excavators, 2 trommel screens, and accompanying off-road trucks) should double the production rate without increasing the unit cost.

The unit costs for most all of the reclamation projects are also remarkably similar, varying from approximately $3.00 per cy to over $5.00 per cy. The unit costs for those projects that did not process the excavated waste are, as expected, lower than those that did process the waste. However, none of the projects were able to recover recyclables to offset the reclamation costs. One project, Frey Farm, actually provided a net revenue of over $13 per ton of waste material excavated, however, the material was being used as a supplemental feedstock for and existing waste-to-energy facility.

It should be noted that the unit costs in the Perdido report span a period from the early to late 1990's. Adjusting the average reclamation excavation unit cost of $4 per cy to 2010 dollars, assuming a 10 year adjustment period, a 2010 reclamation excavation unit cost would be approximately $5.40 per cy. The unit cost for the CalCompact hazardous waste site excavation was about twice the average reclamation unit cost for the other projects due to the extensive regulatory and monitoring requirements for the refuse excavation.

All of the projects reviewed by BAS only screened the excavated waste for soil recovery if it was processed at all. Nearly half of the projects reviewed did not process the material at all. The Naples Landfill attempted to recover the recyclables in the waste, however, it became cost prohibitive due to the process required to upgrade the quality of the recyclables for sale. The only product produced during the screening operations was soil, whether clean or contaminated, and constituted between 25% to over 50% of the excavated volume. The remaining refuse was typically disposed of in an adjacent lined landfill cell.

BAS used the results of this literature search for performing the technical evaluation of the NML reclamation project. The recovered airspace percentages, range of reclamation rates, and unit costs are based on the previous reclamation projects discussed above.

1.1.9 ALTERNATIVES EVALUATED

As discussed earlier, Phase II of the LRMOSP was to include an evaluation of the technical feasibility and costs of the North Miramar Landfill reclamation project. The intent of this draft memorandum is to present the technical feasibilioty prior to developing costs assumptions for the Phase II financial model.

The NML Reclamation Options Study (BAS, 2008) presented a schedule that indicated a start date for the NML reclamation project of August 2008 and a period of 5 years before full-scale implementation of the program, which would have been August 2013, the year the WML was scheduled, at that time, to be at capacity. This dictated an aggressive design, permitting and construction schedule of 5 years. At the writing of this memorandum, June 2010; if the schedule were to be adjusted accordingly then the start date for a full-scale implementation would be approximately August 2015.

However, during the preparation of the NML Reclamation Options Study, the City ESD was permitting a vertical expansion that would increase its airspace capacity by 12.55 million cy. In April 2008 the vertical expansion was approved in a revised SWFP granted to the site. Current projections for WML site life in Phase II of the LRMOSP under the permitted capacity is 2022. Given the increase in airspace and extension of site life, the first step of this evaluation was to evaluate the feasibility of the project with regards to timing.

ASSUMPTIONS

The key assumption to the technical evaluation for reclamation of the NML was that it could only occur while the WML still has airspace. Processing the waste stream can produce multiple products; however, one product that will always be produced is the residual unuseable, unmarketable waste that must be disposed. The lowest-cost alternative is to dispose of this material in the adjacent WML. In addition, while the NML is being reclaimed, the WML will continue to receive incoming waste. The incoming waste stream for the WML is based on Hilton, Farnkopf & Hobson's tonnage projections for Phase II of the LRMOSP.

The volume of soil and waste in-place at the NML were assumed to be 2.8 million cy and 9.0 = 11.8 million cy yards, respectively, and were based on preliminary grading plans included at the back of this appendix, developed by BAS for the Reclamation Options Study (BAS, 2008). The 2.8 million cy of soil does not include the daily and intermediate cover; it is the material that presently overlies the waste in the NML at a thickness ranging between 1.5 ft to over 48 ft as described earlier.

BAS modeled the reclamation of the NML using varying reclamation excavation rates and recyclables recovery percentages. Reclamation excavation rates of 2500, 3500, and 7000 cy/day were selected as they reflect the range of reported rates in previous reclamation projects as well as result in the complete excavation of the NML before the WML's airspace is depleted under the scenarios evaluated. Following is a brief discussion regarding the selections:

- An excavation rate of 2500 cy/day results in a reclamation duration of approximately 14 years.
- An excavation rate of 3500 cy/day results in a 10 year reclamation period.
- An excavation rate of 7000 cy/day rate completes the reclamation in 5 years. This excavation rate is also the maximum rate reported in the literature search and very similar to BAS' experience at the Carson Landfill redevelopment project described above, with no screening of material (direct relocation).

A plot of reclamation excavation rate versus time is shown on Figure 3.

The recyclable percentages evaluated were 0%, 25%, 50% and 75% (by volume) and reflect the range of recovery possibilities. The material that is not recycled was assumed to be disposed of in the WML, resulting in a secondary waste stream of 100%, 75%, 50% and 25%, respectively, of the reclamation excavation rates.

The material to be recycled would include, but not be limited to, ferrous and non-ferrous metals, electronic goods, glass, soil, and waste fines. The soil and waste fines would be stockpiled and used as daily cover in either the WML or future NML. Clean soil, if encountered, would be stockpiled separately for use outside of the lined areas if needed. The other recovered materials would be cleaned and transferred off-site for sale.

The recyclable percentages discussed above could also include feedstock for a conversion technology to generate energy from the excavated waste. For instance, a recyclables recovery percentage of 50% could consist of 30% soil, 15% feedstock, and 5% marketable products.

In an effort to provide additional time for implementation of the NML reclamation project, the model also incorporated an option for diversion of the current incoming waste stream to the WML. This diversion could be achieved by either direct diversion of the waste stream to by-pass the WML, construction of a transfer station at the Miramar Landfill facility, increased source-separation, or utilizing a conversion technology with the incoming waste stream, etc. Two diversion rates were evaluated, 20% and 40%, with the latter reflecting the diversion scenario of the City collected waste going to the Sycamore Landfill under its contract with Republic. No diversion is the default case for each combination of reclamation excavation and recyclable percentage.

BAS also recognized and incorporated into the model, the excavation of the NML, creating airspace that would be available for filling if the WML ran out of airspace prior to completing reclamation. It was assumed that the available airspace in the NML would be immediately available as soon as the WML reached capacity. This assumption would require intricate phasing and lining of the NML development.

The evaluation model is based on the range of potential reclamation excavation rates of waste in the NML only. The model does not include excavation of native material underlying the waste which has been estimated at 20 million cy based on the NML Reclamation Options Study (BAS, 2008).

As stated earlier, the reclamation of the NML can only occur while the WML has airspace available. The reclamation project would accelerate the consumption of airspace in the WML. Therefore, two expansion alternatives for the WML (addressed in a separate memorandum) were included in the NML evaluation model, at 4.0 million cy (Alternative A) and 20.0 million cy (Alternative B).

The impact on WML's airspace was determined for the range of recyclable percentages for each reclamation excavation rate evaluated. The impacts on West Miramar's airspace stemming from waste diversion and the airspace created in North Miramar are additive to the secondary airspace provided by the reclamation recycling.

<u>RESULTS</u>

The results of the evaluations were presented in tables prepared and submitted to ESD which present the results for WML permitted airspace, WML Alternative A, WML alternative B with an option of 20% diversion of the incoming waste stream to the WML and results for WML permitted airspace, WML Alternative A, and WML alternative B with an option of 40% diversion for that component of the range of assumptions for airspace volumes available at the WML.

The reclamation project was considered feasible if the WML had at least 4 years of life remaining following the excavation of waste in the NML. The period of 4 years would provide time for the excavation of the underlying native materials and construction and permitting of the base liner and leachate collection systems. As discussed below, the project was considered viable only if it could be accomplished under a reasonable combination of reclamation excavation rates and recyclable recovery percentages.

As reflected in tables prepared and submitted to ESD, reclamation of the NML is not possible without an airspace expansion at the WML. For each reclamation rate and recyclables percentage, West Miramar's airspace is depleted before North Miramar is excavated.

Tables prepared and submitted to ESD present the results with a 4.0 million cy airspace expansion at the WML. Tables prepared and submitted to ESD show that an airspace expansion at West Miramar must be of sufficient volume to provide the necessary time to not only complete the excavation of North Miramar but also the construction of the first lined cell. As can be seen, the reclamation of the NML only works for the most aggressive scenarios. For instance, the reclamation appears to be viable at an excavation rate of 3500 cy/day, however, the recyclables percentage of the waste must average at least 75%, the incoming waste stream to the WML must be diverted by at least 20%, and all of the available airspace in the NML must be utilized. At first glance, a reclamation rate of 7000 cy/day and at a recyclable percentage of 0% appears to be more viable than the preceding scenario, however, it too requires a diversion rate of at least 20% and utilization of the available airspace in the NML.

Tables prepared and submitted to ESD present the results with a 20 million cy airspace expansion at the WML. An expansion of this size provides sufficient airspace to complete the reclamation of all of the waste in the NML under all but the least aggressive scenarios. The reclamation of the NML is still not feasible with a 20 million cy expansion at the WML at a reclamation excavation rate of 2500 cy/day unless more aggressive measures are employed such as diversion of waste from WML and/or utilization of the airspace in the NML.

In the NML Reclamation Options Study prepared by BAS (July 2008), the goal of the reclamation project was not only the recovery of airspace in the NML by recycling the waste but to also deepen the landfill by excavating approximately 20.0 million cy of native material currently overlain by the waste. It can be inferred by inspection of tables prepared and submitted to ESD that this excavation is also possible under the same range of scenarios as the reclamation of the NML. It should be noted, however, that due to timing it would not be possible to have an aggregate contractor perform the excavation as has been done in the past to off-set costs so excavation costs would be similar to recent mass excavation costs at the WML. Aggregate production and sales is dependent on the economy and the market for their product. Aggregate contractors typically operate as a lean production and only produce material when required. Even if the market is there for the material, the typical production rates for a small processing operation (one adjustable screen) is approximately 3,000 cy/day. Thus, a 20 million cy excavation would require 24 years, which is beyond the time frame needed for excavation and is too long a time frame to assume market consistency.

In order for the NML reclamation project to be feasible, a reasonable combination of reclamation rates and material recovery percentages with an airspace expansion at WML is necessary. BAS defines a reasonable combination of excavation and recovery rates as that which can be consistently reproducible and would be considered the average achieved rates during the course of the project. Based on our literature search of previous reclamation projects as well as extensive construction experience, reasonable combinations would be as follows: for 2500 and 3500 cy/day, the recovery percentage would be 25% for planning purposes; for 7000 cy/day, a recovery percentage of 0%.

Figure 4 shows the remaining site life in the WML following the complete exhumation of waste in the NML for a range of expansion capacities at the WML. The figure was prepared assuming excavation rates of 3500 cy/day and recyclable percentages of 25% and 50%, as well as 7000 cy/day and a recyclable percentages 0%. As can be seen in Figure 4, if 4 years of life are required to remain in the WML following the excavation of waste in the NML, the following expansion capacities at the WML are necessary:

- 21.8 million cy WML expansion for 3500 cy/day excavation and 25% recovery at the NML;
- 19.5 million cy WML expansion for 3500 cy/day excavation and 50% recovery at the NML; and
- 14.5 million cy WML expansion for 7000 cy/day excavation and 0% recovery at the NML.

It is clear from Figure 4 that a reclamation excavation rate of 3500 cy/day and 25% recovery is not feasible as it would require an expansion larger than 20 million cy at the WML. The technical memorandum discussing the two expansion alternatives for the WML identified community opposition, as well as environmental and aesthetic impacts associated with the 20 million cy expansion alternative. Mitigation measures would almost certainly impact the optimal expansion airspace available. Therefore, the NML reclamation scenario of 3500 cy/day excavation and 50% recovery requiring a 19.5 million cy expansion at WML is also not likely feasible.

The scenario of 7000 cy/day excavation rate with 0% recovery, while technically feasible, would not achieve ESD's primary goal for the project of material recovery and additional airspace capacity.

1.1.10 CONCLUSIONS AND RECOMMENDATIONS

As initially defined earlier, the goals of the NML reclamation project were to:

- Recover soil for developmental and operational use at the Miramar landfills;
- Recover and sell marketable materials; and
- Provide for an airspace expansion of the NML by excavating the underlying native materials.

Based on the model developed with varying assumptions for reclamation excavation, material recovery (soil and/or recyclables), airspace expansion at the WML, the first two goals cannot be achieved for the NML reclamation project due to timing.

In order to achieve the third goal of the NML reclamation project, the results of our detailed technical evaluation indicate that the project could not proceed without a high rate of reclamation excavation (7000 cy per day) and a significant expansion of airspace at the WML. The expansion at the WML must provide sufficient capacity and site life to not only exhume all of the waste in the NML, but also provide time to excavate the underlying native materials and construct the new cell in the NML. As discussed earlier, the expansion at the WML must provide at least 14.5 million cy of airspace that is available for refuse and daily cover which would provide 4 years to complete the excavation of the underlying materials and construct the new cell in the NML.

Larger expansions than 14.5 million cy would allow flexibility in the excavation rate of the waste in the NML (assumed at 7,000 cy/day), excavation and processing alternatives (aggregate sales) for the native soil underlying the NML, or a longer permitting duration. For example, as can be inferred from Figure 4, an approximate 16.6 million cy expansion would allow the permitting to slip by approximately 1 year (January 2017).

BAS concludes, then, that the reclamation of the NML is only viable if the waste is excavated at a rate of 7000 cy/day and the material is not processed (i.e., direct relocation). A pilot study can still be completed to determine if material can be processed at this rate and if successful, implemented. If the rate proves to be unsustainable, the assumption for processing can be eliminated and the waste would have to be directly relocated. For planning and costing purposes, BAS recommends assuming that the waste not be processed at this excavation rate.

Given that the NML reclamation project is not feasible without a substantial expansion at the WML (of at least 14.5 million cy), a decision needs to be made that ESD wants to pusue both projects at the same time which includes permitting and implementation. Costs for the expansion alternatives at the WML have been provided in a separate memorandum. The “ballpark” costs for reclamation of the NML as presented herein approach $100 million as summarized below (without consideration of the liner/LCRS/infrastructure development costs):

- 9.0 million cy for reclamation excavation at $5.00/cy = $45 million
- 2.8 million cy for cover soil excavation at $2.20/cy (Module E avg. exc. unit cost) = $6.2 million
- 20 million cy for subgrade soil excavation at $2.20/cy = $44 million

These are order of magnitude costs for the NML reclamation project and can be further developed if ESD wishes to pursue both expansion projects.

FIGURES 1 – 3

FIGURE 1

BAS
(909) 860-7777
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE DIAMOND BAR, CA 91765

MIRAMAR LANDFILLS

SITE CONTEXT

JOB NO. 2007.0069
DATE 03-2008
DRAWN BY B.R.A.
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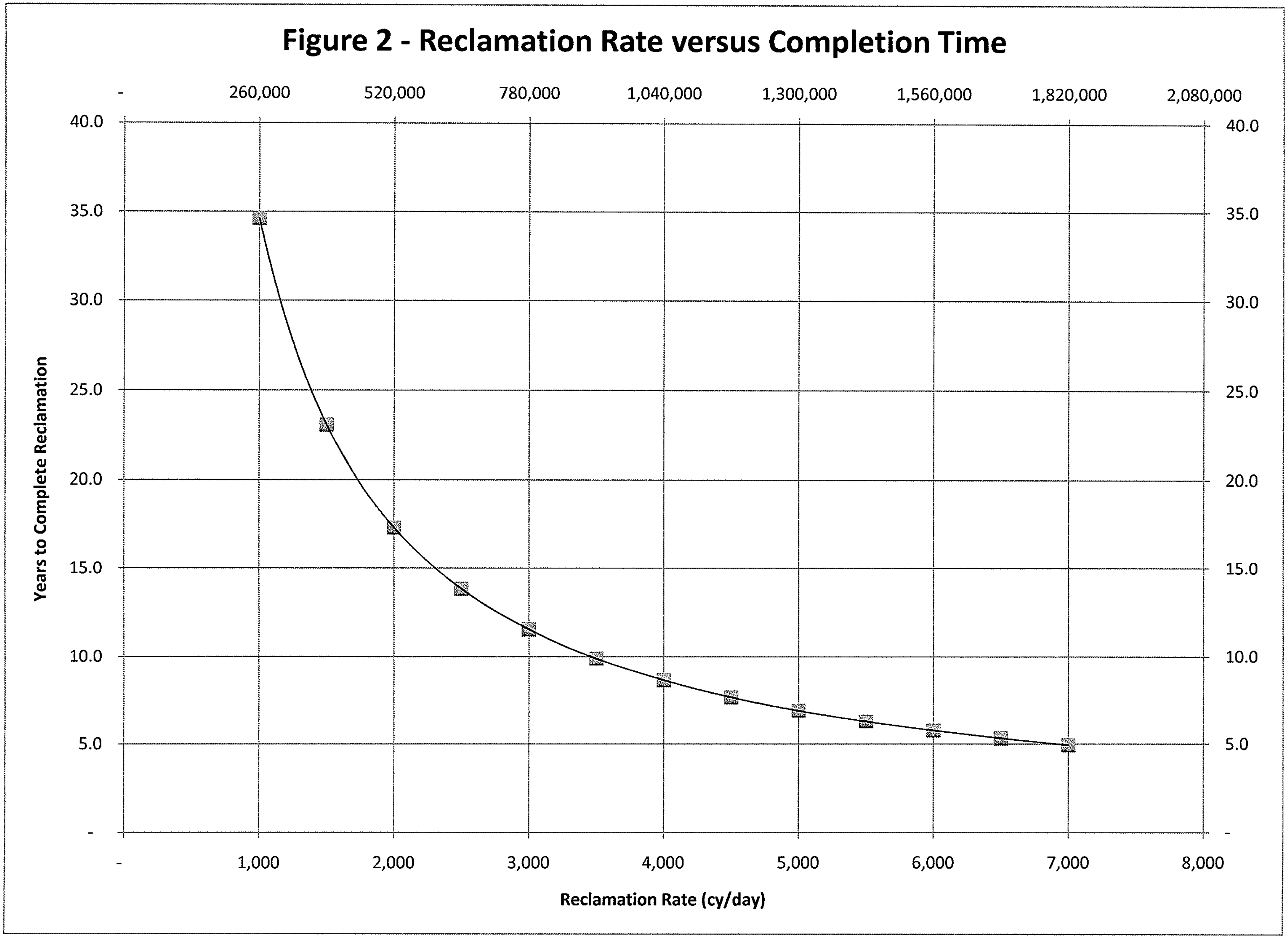


Figure 2 - Reclamation Rate versus Completion Time
-
260,000
520,000
780,000
1,040,000
1,300,000
1,560,000
1,820,000
2,080,000
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
-
Years to Complete Reclamation
-
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
Reclamation Rate (cy/day)

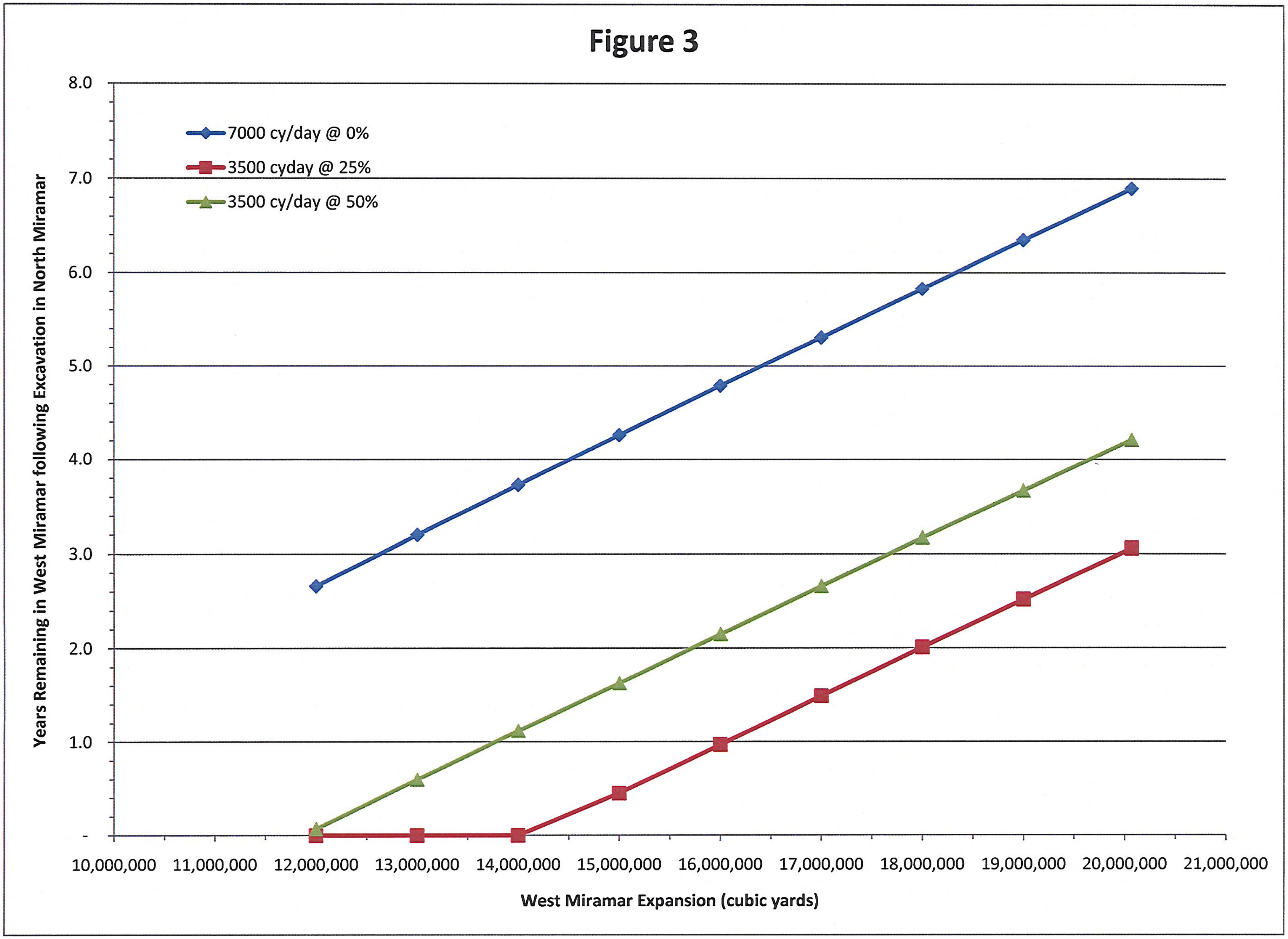
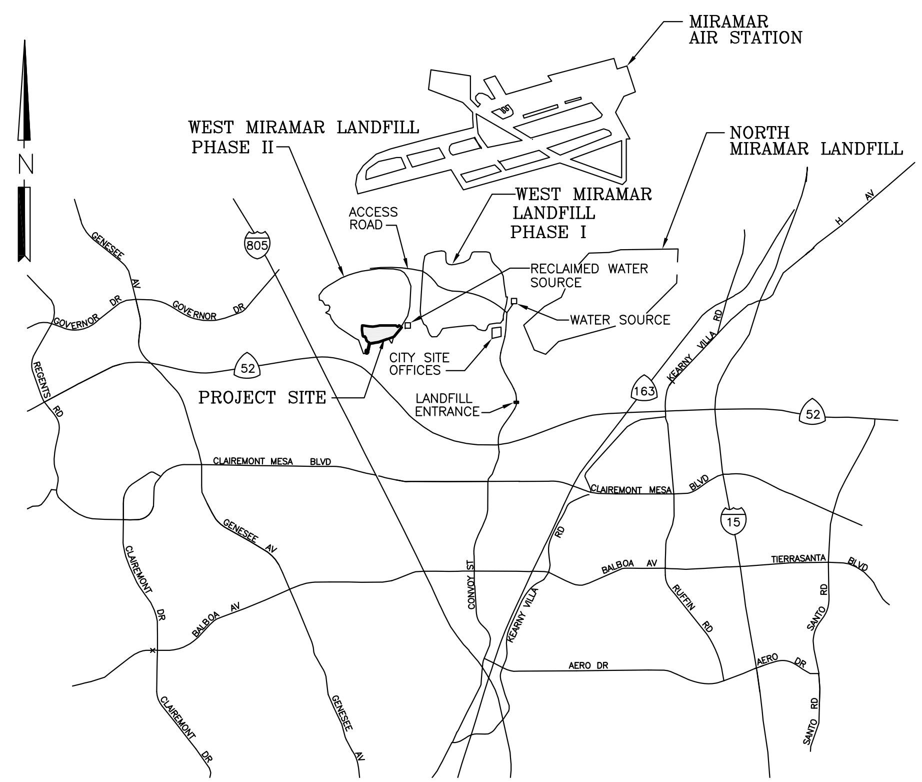


Figure 3
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
-
7000 cy/day @ 0%
3500 cyday @ 25%
3500 cy/day @ 50%
Years Remaining in West Miramar following Excavation in North Miramar
10,000,000
11,000,000
12,000,000
13,000,000
14,000,000
15,000,000
16,000,000
17,000,000
18,000,000
19,000,000
20,000,000
21,000,000
West Miramar Expansion (cubic yards)

NORTH MIRAMAR RECLAMATION PROJECT

PRELIMINARY CONCEPT DRAWINGS

CITY OF SAN DIEGO
ENVIRONMENTAL SERVICES DIVISION
CHRIS GOVAVER, DIRECTOR



VICINITY MAP
N.T.S.

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2	SITE PLAN
3	EXCAVATION PLAN
4	GRADING PLAN
5	CROSS-SECTIONS
6	CROSS-SECTIONS
7	CROSS-SECTIONS
8	CROSS-SECTIONS

NORTH MIRAMAR LANDFILL

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BAS
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765 (909)860-7777
DESIGNED BY: CHECKED BY:
DRAWN BY: FILE: 01455DB

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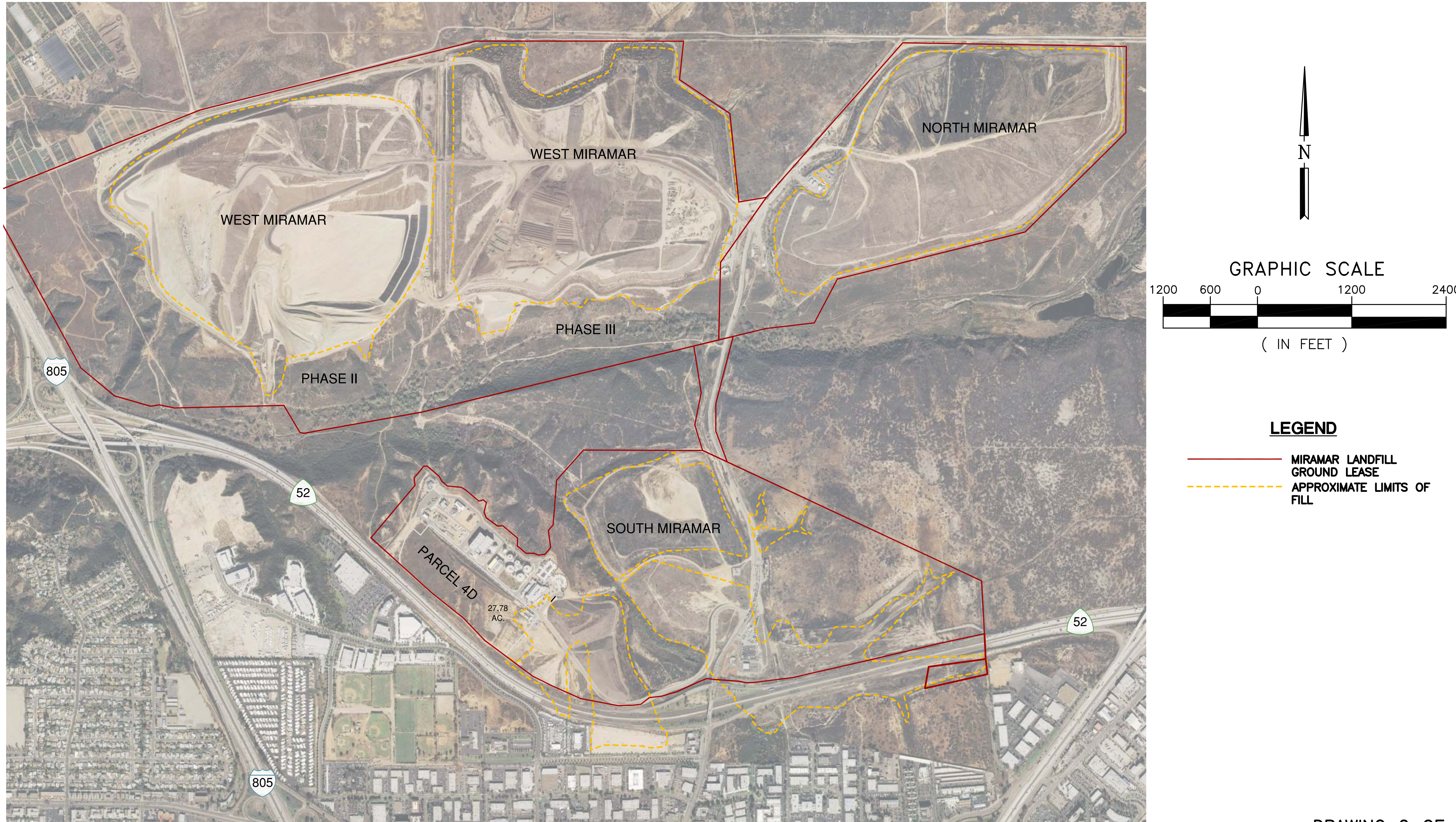

DRAWING 2 OF 8

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(909) 860–7777
BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE DIAMOND BAR, CA 91765

MIRAMAR LANDFILLS

PRELIMINARY EXCAVATION PLAN

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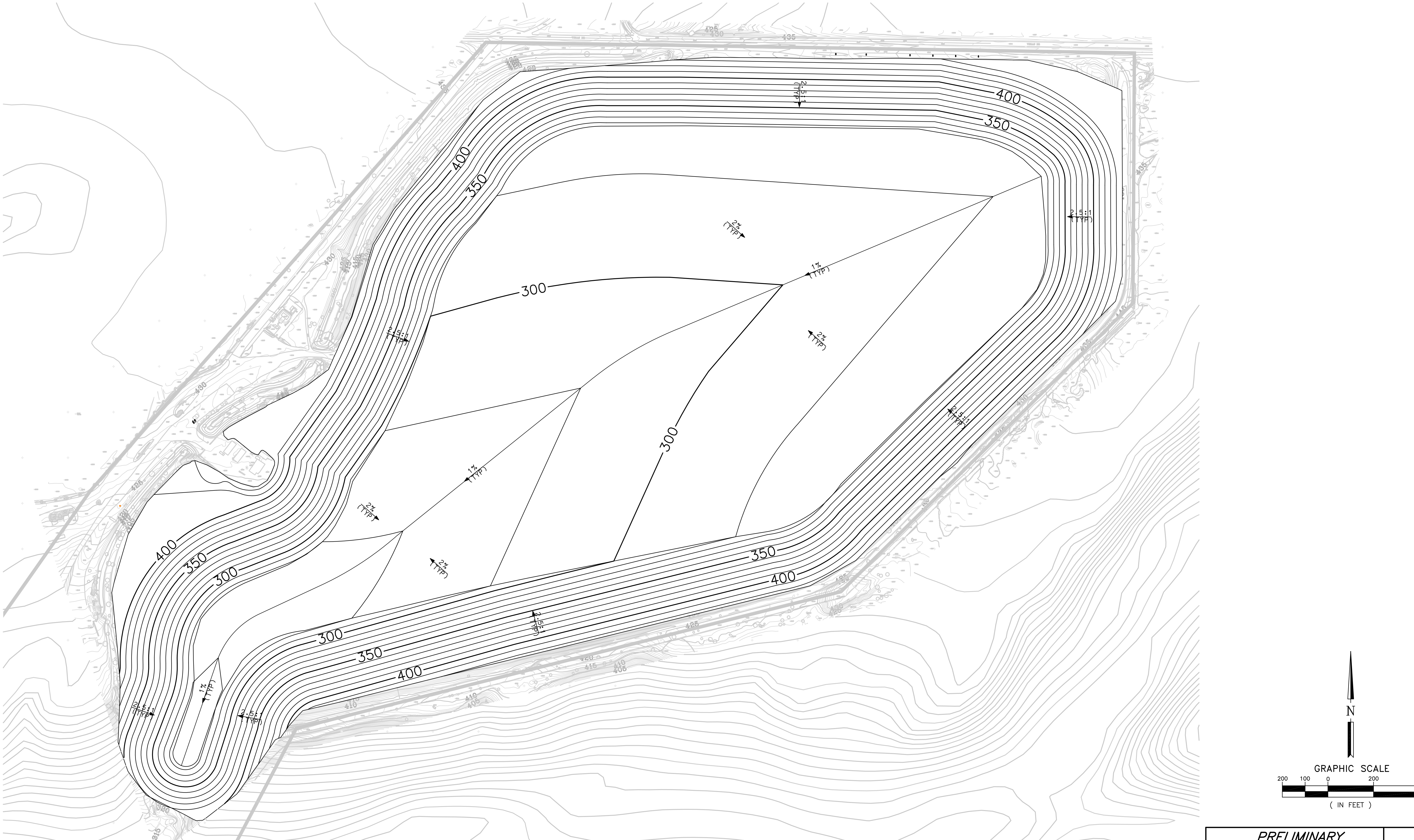

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BRYAN A. STIRRAT & ASSOCIATES

CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765 (909)860-7777

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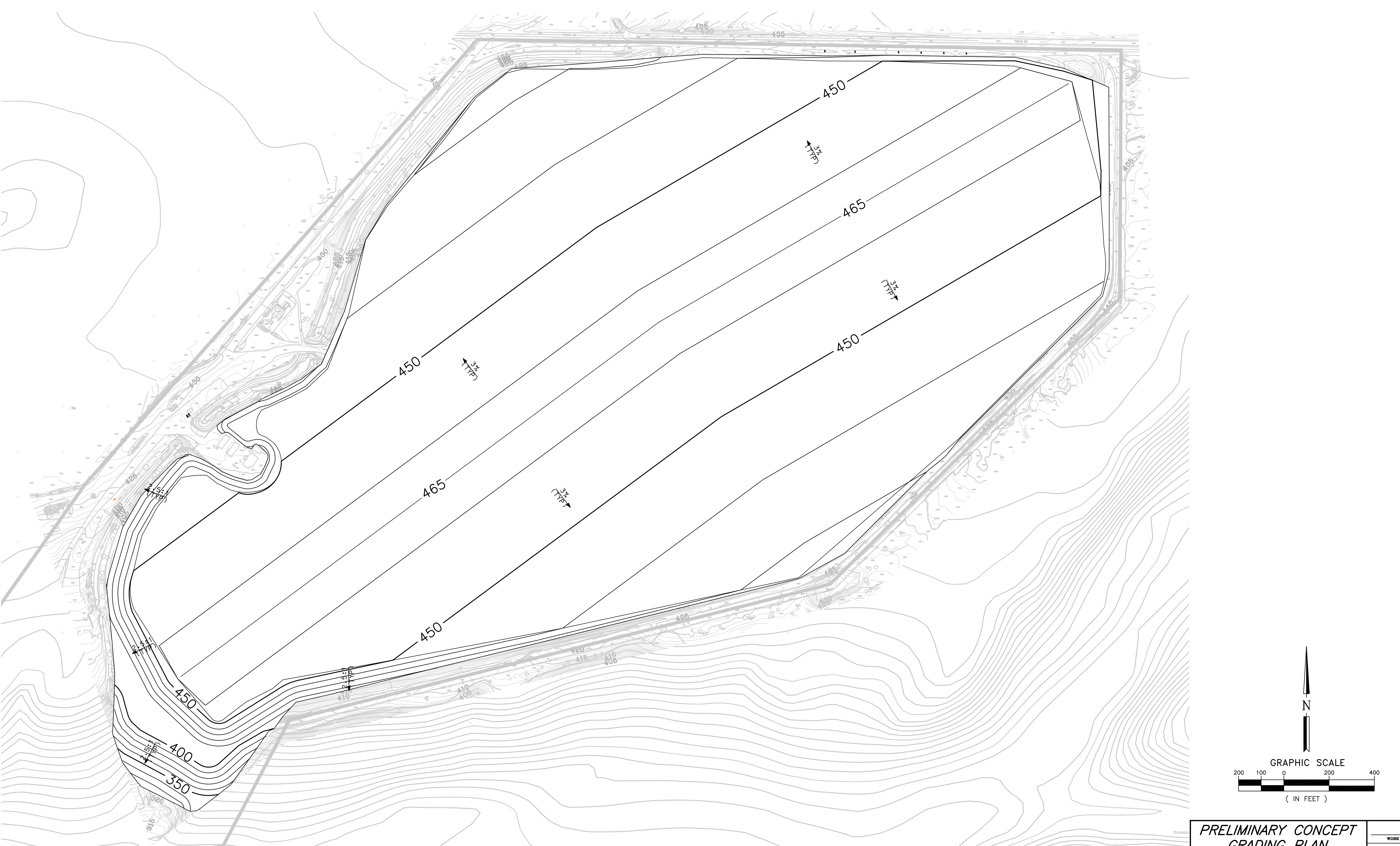

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CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE
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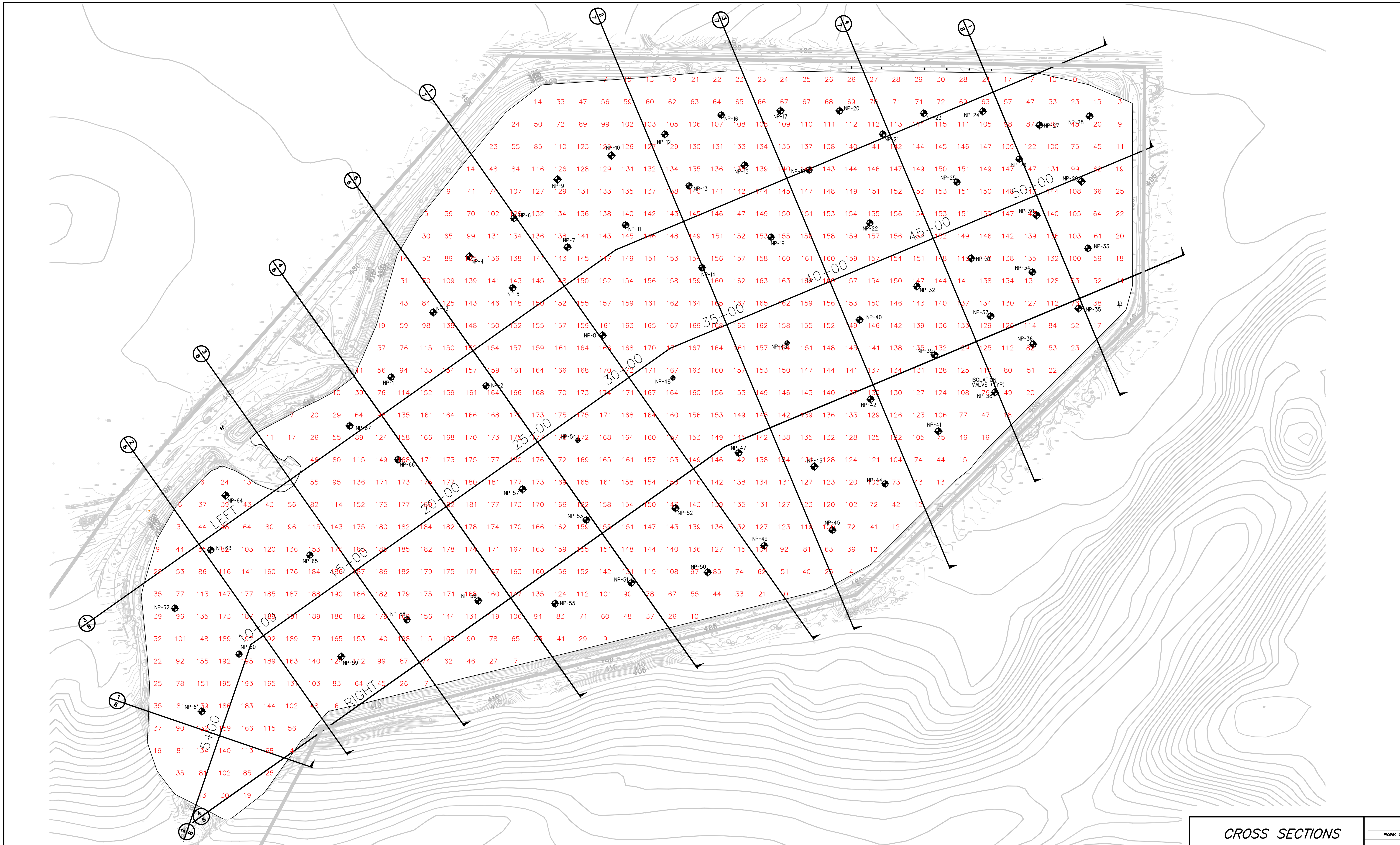

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1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765 (909)860-7777

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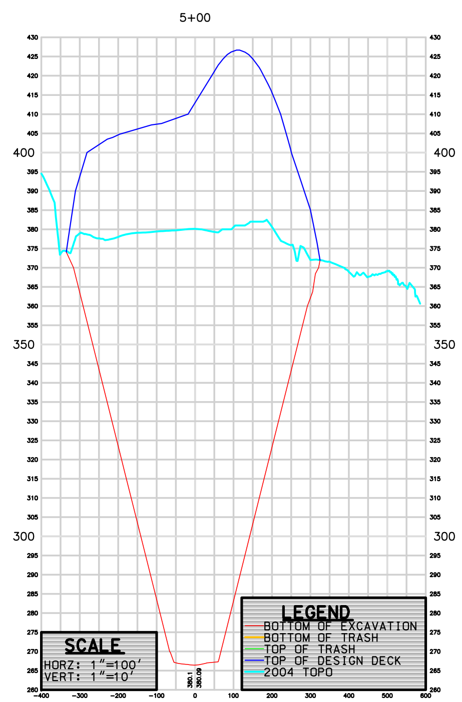

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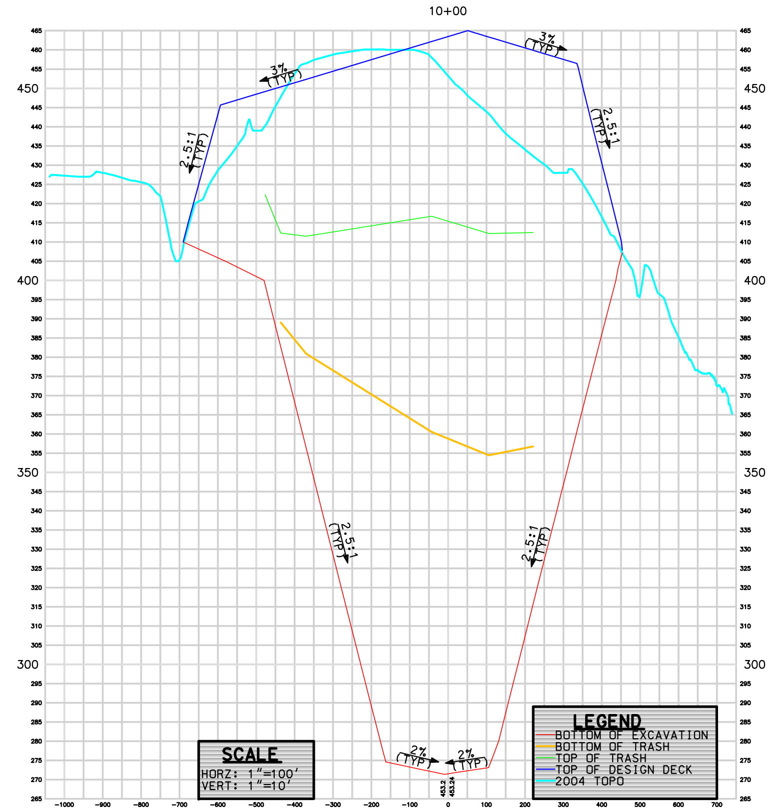

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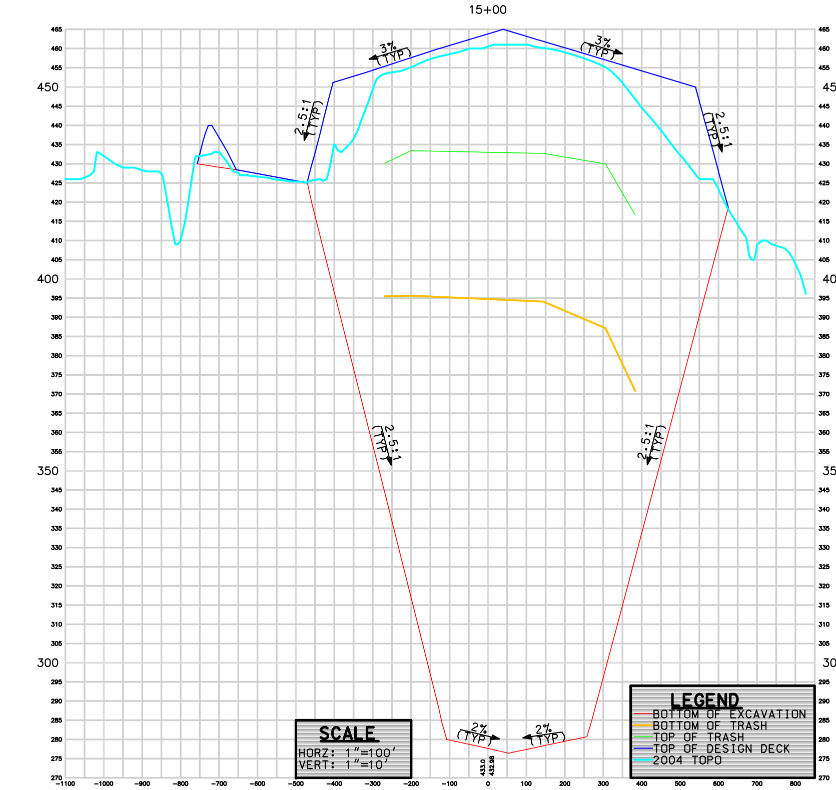

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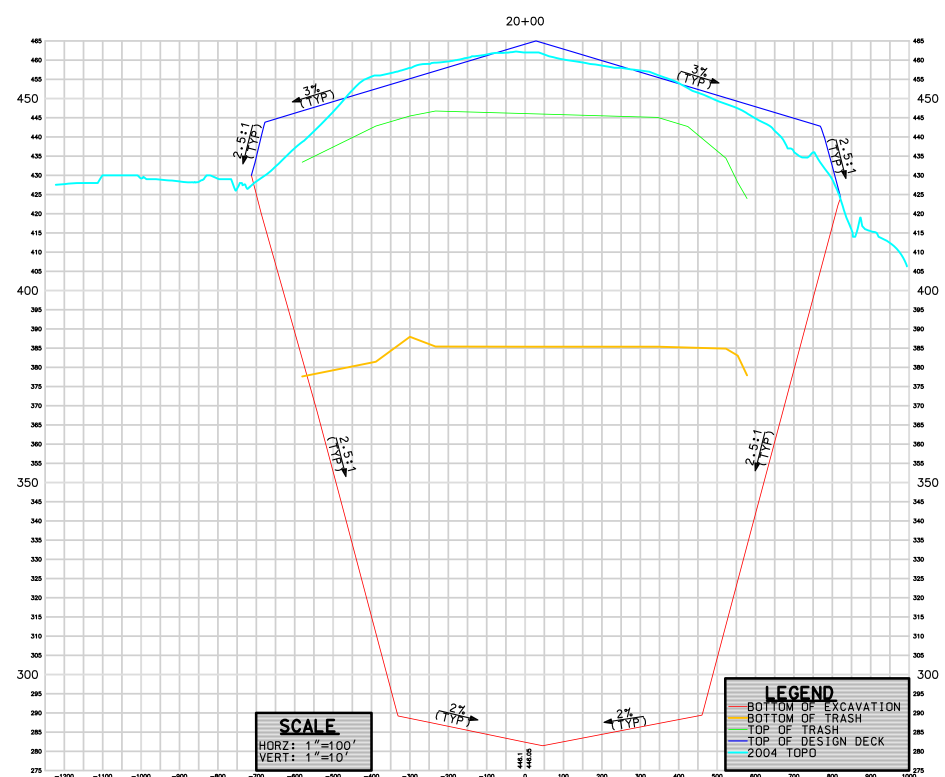

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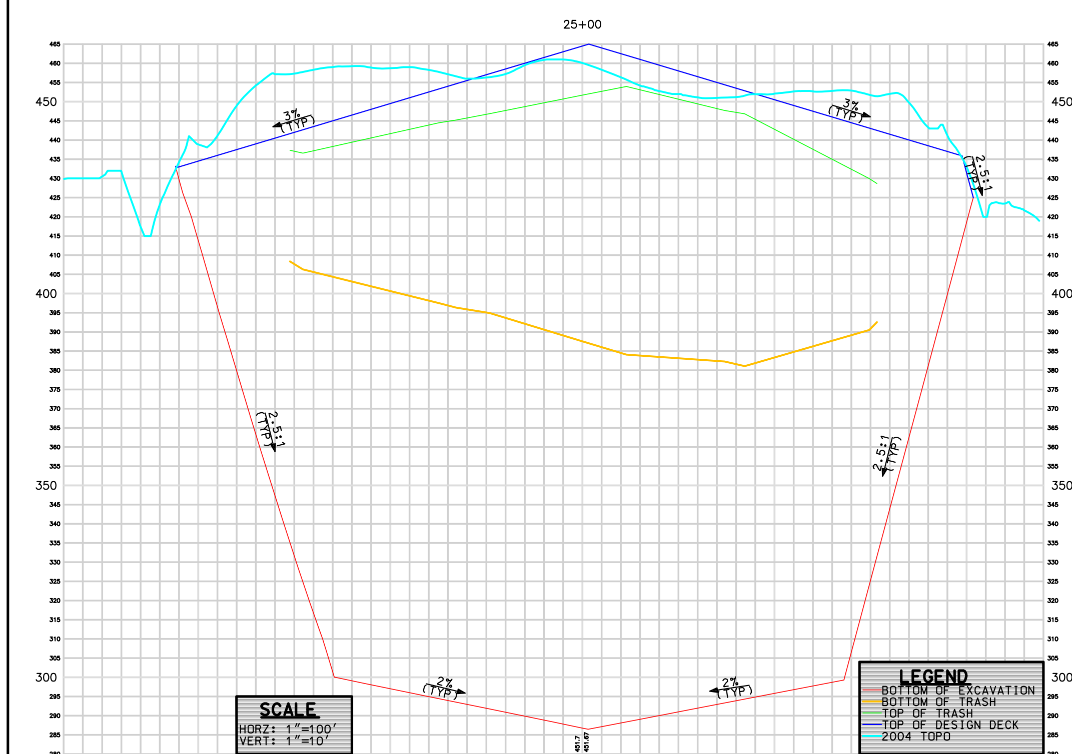

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CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765 (909)860-7777

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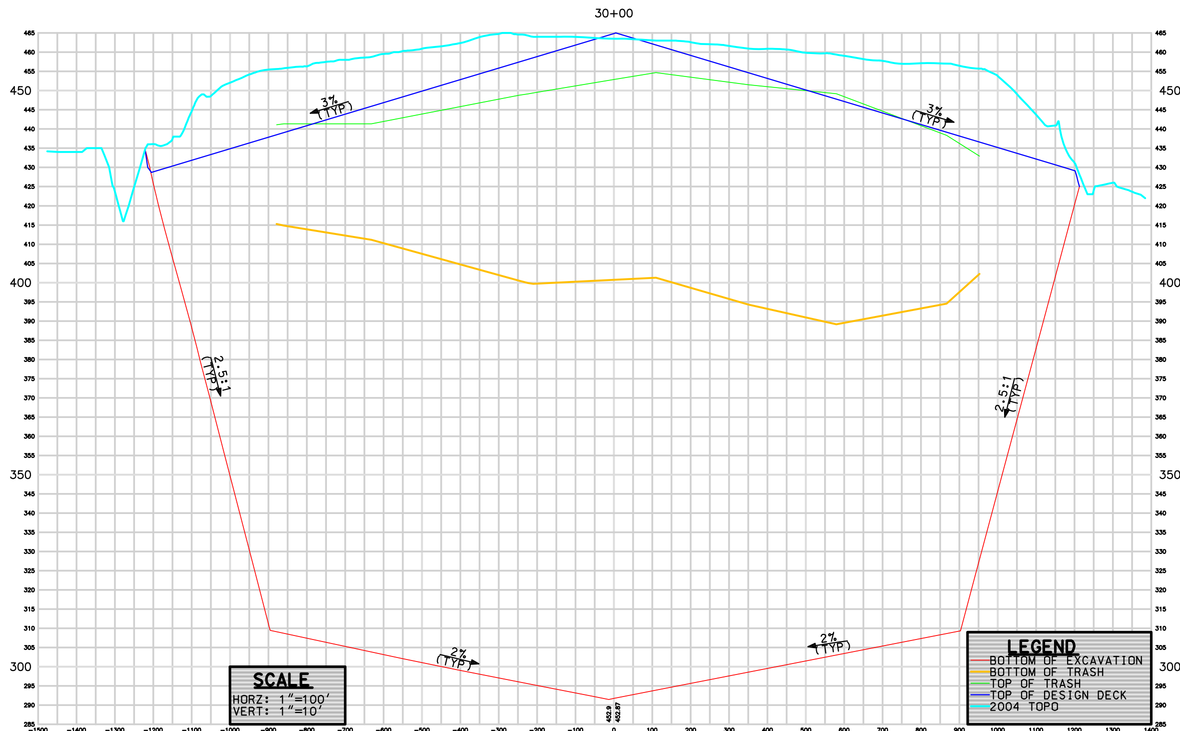

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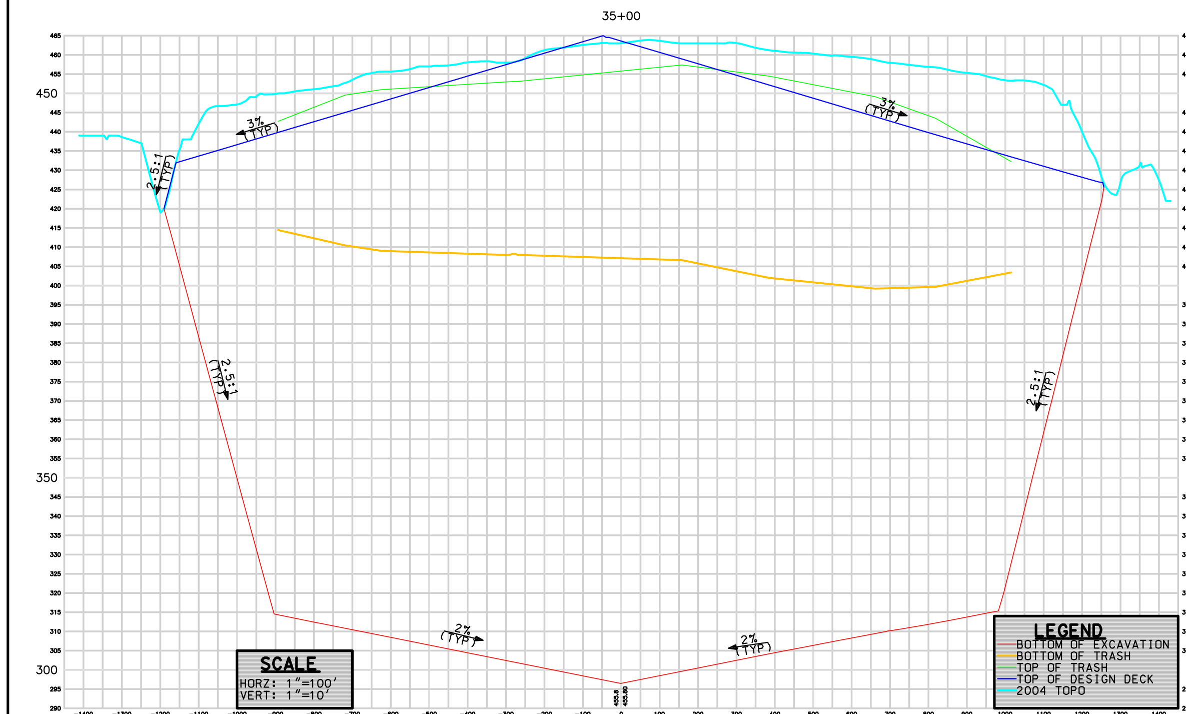

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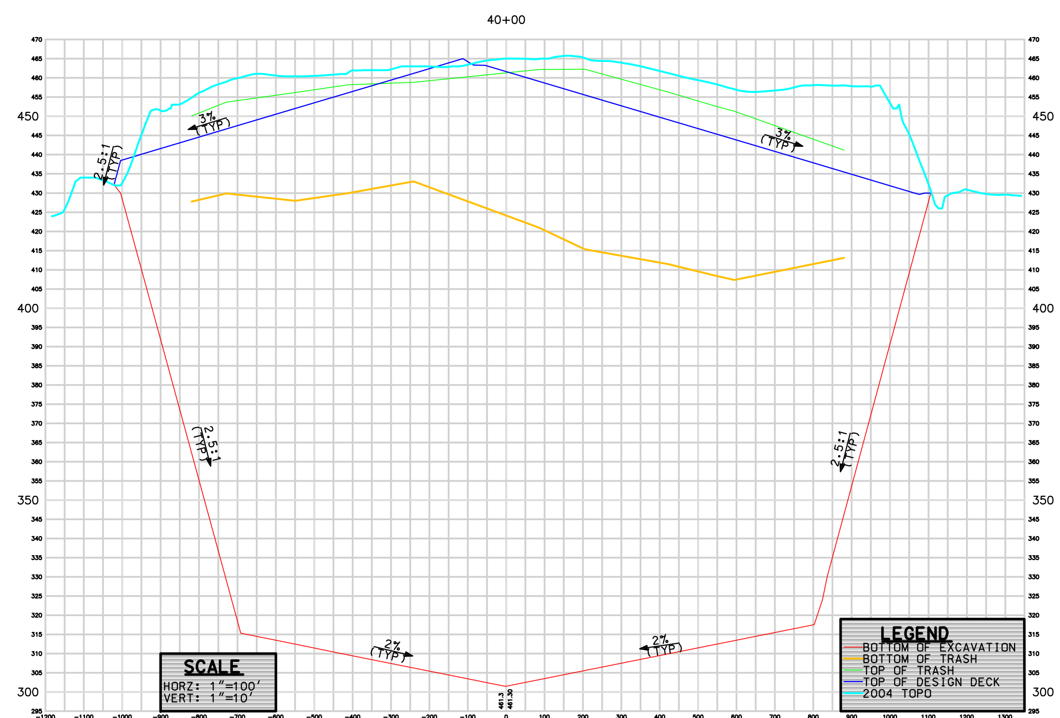

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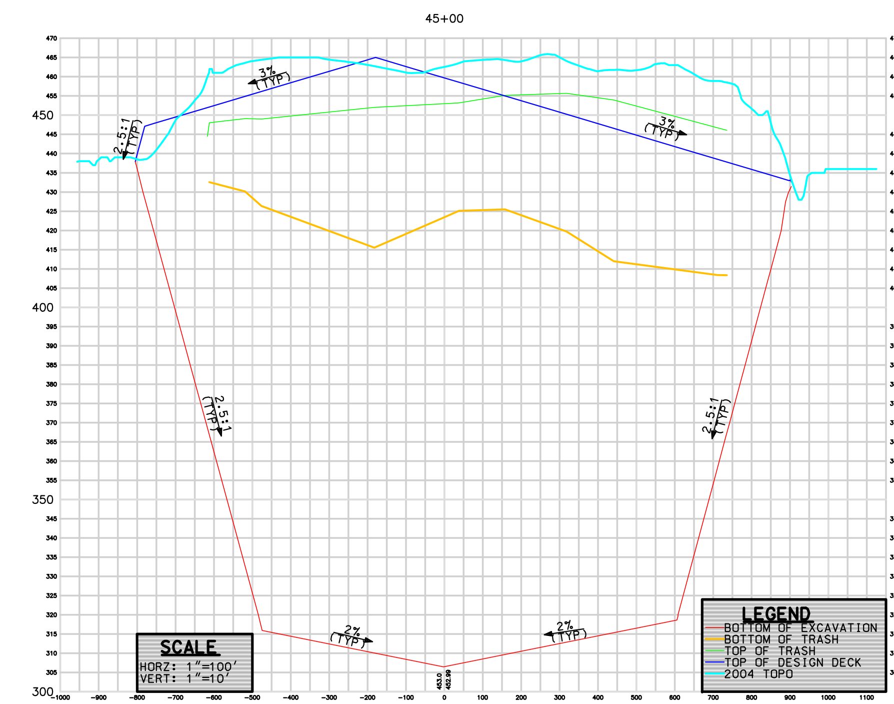

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CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765 (909)860-7777

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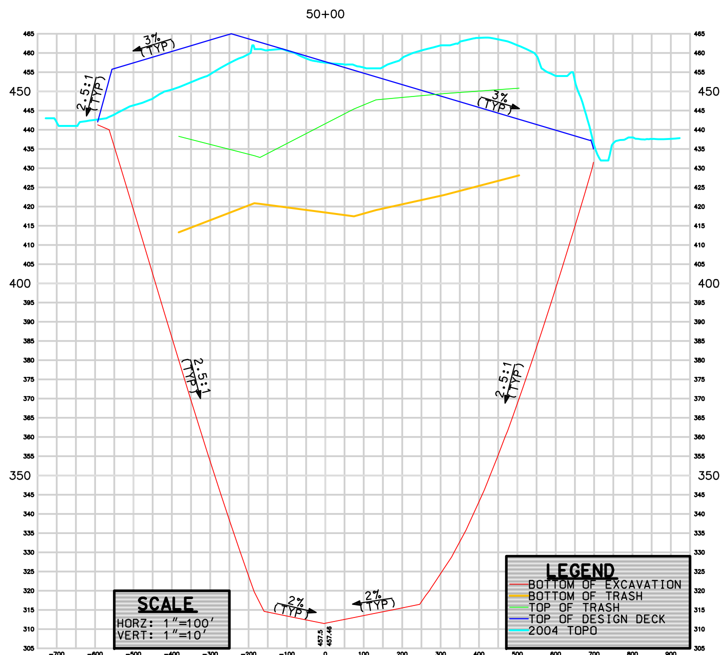

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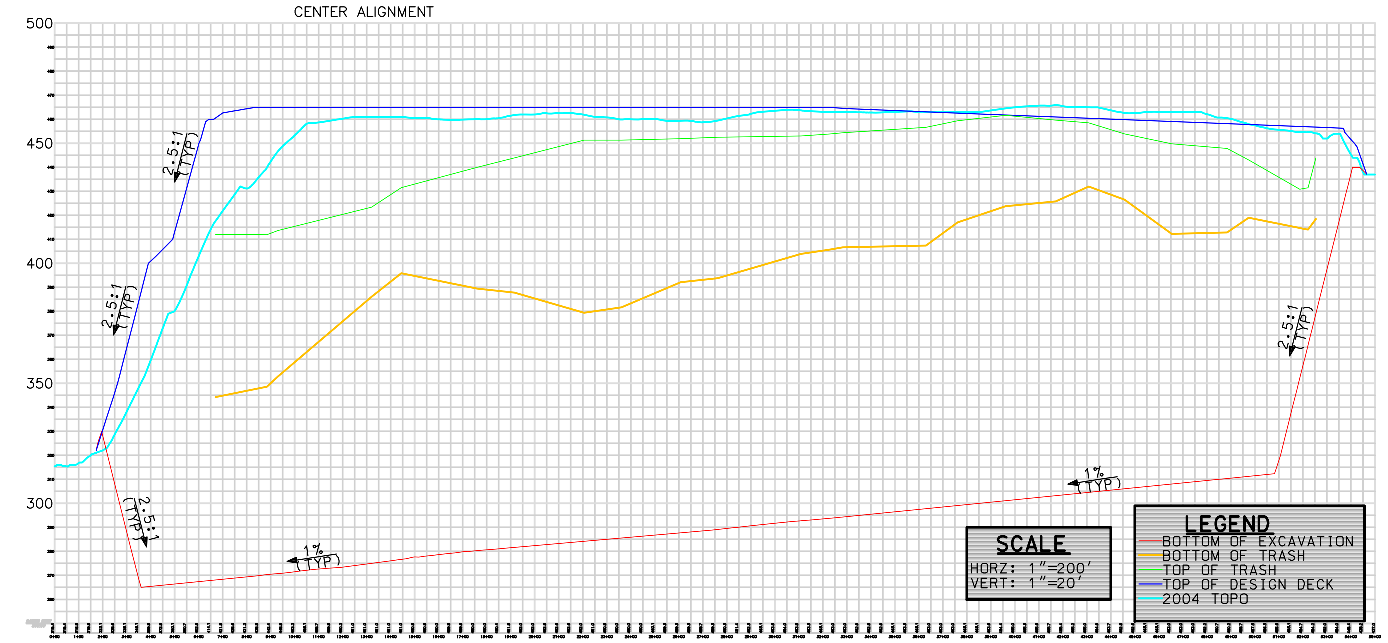

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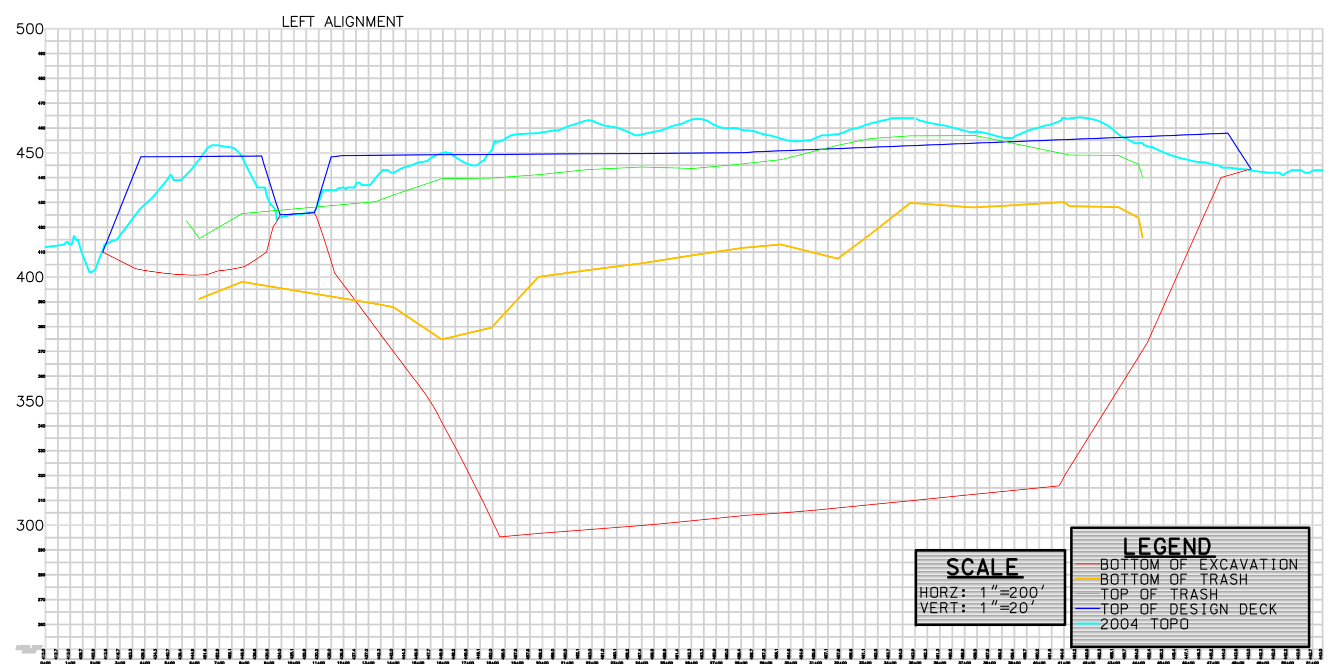

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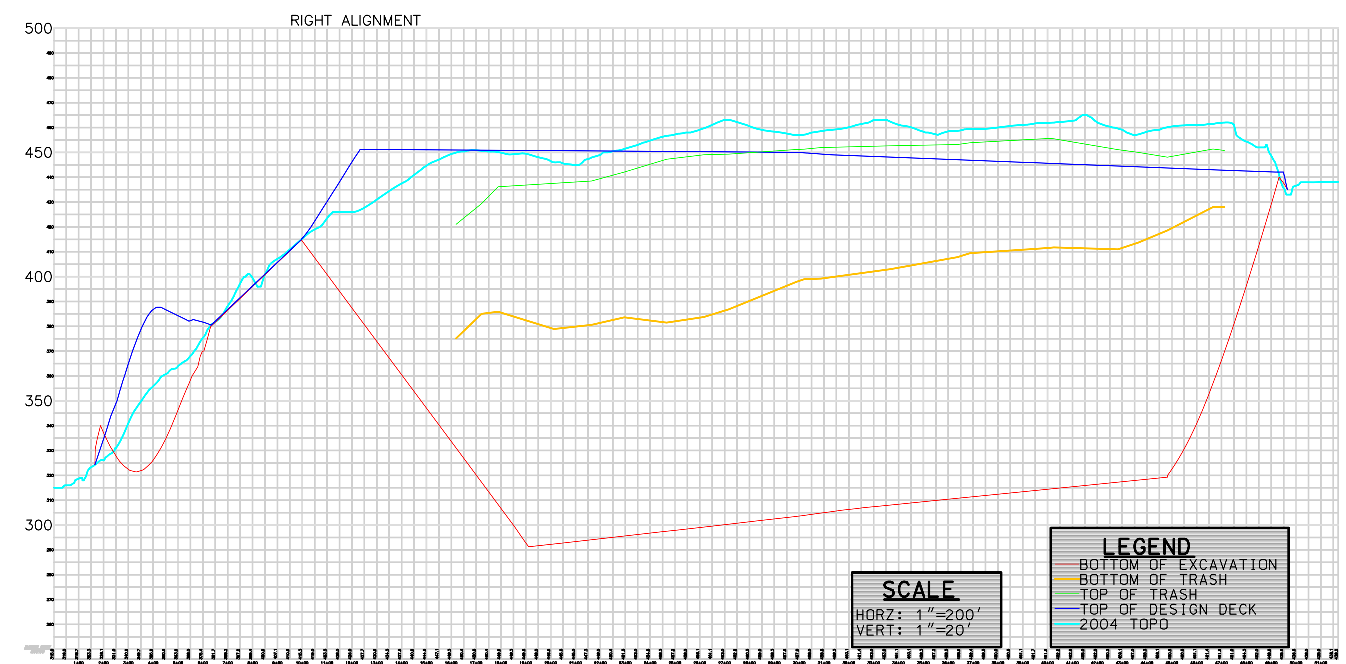

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BRYAN A. STIRRAT & ASSOCIATES
CIVIL AND ENVIRONMENTAL ENGINEERS
1360 VALLEY VISTA DRIVE
DIAMOND BAR, CA. 91765 (909)860-7777

DESIGNED BY: CHECKED BY:
DRAWN BY: FILE: 38331DB

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Refuse Disposal Division
City of San Diego

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APPENDIX C

CONVERSION TECHNOLOGY PROJECTS AND INITIATIVES - PROGRESS REPORT

CONVERSION TECHNOLOGY PROJECTS AND INITIATIVES

PROGRESS REPORT

Submitted to:

Bryan A. Stirrat & Assoc.
1360 Valley Vista Drive
Diamond Bar, CA 91765
(909) 860-7777

Prepared by:

Clements Environmental Corporation
15230 Burbank Boulevard
Suite 103
Sherman Oaks, CA 91411
(818) 267-5100

January 2011

TABLE OF CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

This report provides an update of conversion technology (CT) development in California with the inclusion of a few notable projects from other areas of the country. CTs include a wide array of thermal, biological, chemical, and mechanical technologies capable of converting municipal solid waste (MSW) into energy such as steam and electricity; fuels such as hydrogen, natural gas, ethanol and biodiesel; and other useful products and chemicals, providing greater than 80 percent diversion from landfill disposal.

CTs are successfully used to manage solid waste in Europe, Israel, Japan, and some countries in Asia. Pilot and demonstration CT facilities in the United States and Canada have led the way toward development of larger-scale demonstration and commercial facilities in these countries.

The information presented herein is based on available, published information, and consulting team knowledge.

2.0 SUMMARY OF CONVERSION TECHNOLOGY INITIATIVES IN CALIFORNIA

Several jurisdictions in California are in the process of developing CT projects. The following sections contain brief summaries.

2.1 Los Angeles County

Since 2004, the Los Angeles County Department of Public Works (LADPW) has been evaluating and pursuing the development of conversion technologies to reduce landfill disposal of municipal solid waste (MSW). To date, the County has followed a deliberate multi-phased approach to accomplish this task. Phase I included a preliminary evaluation, screening and ranking of CT companies and identification of material recovery facilities and transfer stations (MRF/TS) that could potentially host a CT facility. Phase II consisted of a detailed evaluation of selected technologies and MRF/TS sites, followed by a Request for Offers that was issued to recommended companies and sites. Three companies were selected to participate in development of demonstration facilities, and a Memorandum of Understanding was negotiated with each. These companies are:

- International Environmental Solutions (IES)
- Ntech
- Arrowbio

The purpose of the Phase III projects is to demonstrate the technical, economic, and environmental viability of such facilities in Southern California, and also to establish pathways for permitting and financing commercial scale CT projects in the County. These three demonstration projects are at various stages of development and include both thermal and biological conversion processes.

In 2010, the County initiated Phase IV activities, which focus on establishing larger, commercial-scale CT facilities in Los Angeles County for the purpose of providing alternatives to landfill disposal of post-recycled MSW. The County envisions one or more commercial CT facilities, ranging in size, being developed throughout the County as a means to provide long term solid waste management capacity, to reduce dependence on exporting waste to remote landfill sites outside of the County, and to stabilize waste disposal rates. Such facilities would process primarily post-recycled MSW, but could potentially process other materials such as food and yard waste, biosolids, non-recycled construction and demolition (C&D) materials, and other non-hazardous wastestreams.

A Siting Feasibility Analysis is being prepared by Alternative Resources, Inc. (ARI) and Clements Environmental Corporation pursuant to the following motion by the Los Angeles County Board of Supervisors on April 20, 2010:

"Instruct the Director of Public Works to:

a) In coordination with appropriate stakeholders, including the County Sanitation Districts and other appropriate County departments, assess the feasibility of developing a conversion technology facility at one or more County Landfills; and

b) Report back to the Board within six months, with its findings regarding the development of a conversion technology facility at a County landfill, and identifying other potentially suitable sites within Los Angeles County."

LADPW staff has been directly involved in the coordination with appropriate stakeholders, including conducting outreach, attending meetings, developing evaluation criteria, and assisting in the gathering of information necessary for the feasibility assessment. Los Angeles County has organized a Conversion Technology Sub-committee as part of their Local Task Force in order to further evaluate sites that have been identified for possible CT projects. Six (6) sites, including three (3) local landfills, have been rated as high priority from the original sixteen (16) sites assessed. Efforts are ongoing to gather more information on high priority sites to determine their potential for hosting a CT facility.

2.2 City of Los Angeles – Bureau of Sanitation

In 2004, at the direction of the Mayor of Los Angeles, City Council, and the City's blue print policy the RENEW LA report, the Los Angeles Bureau of Sanitation (BOS) initiated a study to consider Alternative Technologies (Alt Tech - including CTs and combustion Waste-to-Energy (WTE) technologies) for converting MSW to renewable energy and reducing reliance on landfills. Various phases of the study have been led by URS Corporation and HDR. The study's objective was to identify clean new methods that are environmentally friendly, energy efficient, socially acceptable and economical. This study determined that several technologies do exist to process MSW into a renewable energy sources and are commonly used in other countries. In 2005, City staff and elected officials visited some of these facilities in Europe to determine the viability of incorporating such technologies in the City of Los Angeles. This resulted in the next phase of the Alt Tech study moving forward in early 2006 with consultants hired to refine the technology selection process and screen potential development partners.

The BOS released a request for proposal (RFP) in February 2007 to select a technology and development partner to site and construct a conversion facility. As part of this effort technical consultants and public outreach consultants have been hired to support BOS staff and provide public education and information. RFP responses were received by August 22, 2007 and a total of 12 technology suppliers submitted applications. The BOS is currently reviewing the submissions.

The proposals were divided into an "emerging" track for smaller scale technologies and a "commercial" track for larger capacity and more developed technologies. ArrowBio was selected as the preferred technology for the emerging track and three potential vendors have been shortlisted for further evaluation for the commercial track; these being:

- Wheelabrator Technologies Inc.
- Urbaser & Keppel Seghers
- Green Conversion Systems

The ArrowBio team is in contract negotiations with the BOS to build a 150 TPD Anaerobic Digestion (AD) project, expandable to 300 TPD.

2.3 Santa Barbara County

The County of Santa Barbara and the Cities of Santa Barbara, Goleta, Solvang and Buellton have joined together to identify and evaluate the feasibility of various CTs that provide alternatives to landfilling of solid waste in southern Santa Barbara County.

The County and cities produced a feasibility report in April 2008 and issued a Request for Information. Of the responses, eight vendors were identified that could possibly provide a CT facility at the Tajiguas Landfill. A Request for Proposals (RFP) was then released in October of 2009 and proposals were received April 2010. In response to the RFP, four companies submitted formal proposals. These proposals have been reviewed and a preferred vendor(s) is to be selected in February 2011. Although the prospective technologies are varied, each would convert the material they process by 90% to 100%, significantly reducing the area's dependence on landfilling. The four finalists are all thermal technologies and include:

- Plasco Energy Group
- NRG
- Mustang Power
- IES

2.4 Salinas Valley Solid Waste Authority

The Board of Directors of the Salinas Valley Solid Waste Authority (SVSWA) began investigating alternatives to landfill disposal of solid waste in February 2005 with a series of study sessions. Due to the 2005 approval of a goal to achieve 75% diversion from landfills by 2015, the focus of these studies shifted to researching emerging technologies. This goal was reaffirmed by the Board as one of the Strategic Objectives adopted in August 2010. One of the primary components of this process was the completion of a Waste Composition Study in 2007 which defines the SVSWA waste stream and allows for the implementation of diversion programs specific to the types of waste that can be effectively recycled. Only the waste which cannot be separated or reclaimed is proposed as feedstock for a conversion technology.

A four-member Conversion Technology Commission (CTC) was formed after the SVSWA determined that a non-combustion based technology was preferred. Also further investigation on the properties identified for a future landfill site for the SVSWA waste stream were suspended. The goal of the Commission is to identify the best and most effective conversion technology(ies) applicable to the Salinas Valley.

The Commission visited both aerobic and anaerobic composting facilities, materials recovery facilities, the UC Davis biodigester, autoclave facilities, gasification plants in California and Japan, a methane to electricity generation plant, waste to energy plants, and a plasma arc gasification facility in Canada.

A Statement of Qualifications and Requests for Proposals were initiated in January 2008. Three (3) proposals were extensively reviewed and ranked based on goals and objectives outlined by the SVSWA. Since November 2009, staff has been in discussion with the two top ranked vendors, PlascoEnergy and Urbaser S.A. to define the projects proposed as the cornerstone of the SVSWA transition of the Johnson Canyon Landfill into a Resource Management Park. It is anticipated that a vendor will be chosen in January 2011 to begin detailed contract negotiations and to start the permitting process.

2.5 City of Glendale

In September 2007, The City of Glendale Public Works Department, in cooperation with the Los Angeles County Department of Public Works (LADPW), presented the City Council with an overview of the current state of waste conversion/waste to energy technology. At the direction of the City Council, the Public Works Department has continued to coordinate with the County on their efforts and to look at opportunities to develop a project within the City of Glendale. Additionally, the Public Works Department is in the process of developing a Zero Waste Policy for consideration by the City Council. It is anticipated that conversion technologies will play a major role in achieving a zero waste goal.

On April 20, 2010, the City Council adopted a motion authorizing the city manager to assemble a project team to research, analyze, report and recommend a waste conversion project for the City of Glendale. The motion also provides funding of $200,000 to research emerging technologies to help meet the City's long-term waste reduction goals. At this time, the City has selected a consultant and is prepared to move forward with a more extensive review of various CTs and the potential energy production capabilities of a facility to be located at the City's Scholl Canyon Landfill.

The City of Glendale is currently pursuing opportunities to partner with the LADPW on the development of a project in Glendale. The following is a summary of City Council Action Items established in April 2010:

- Continue to coordinate with the Los Angeles County Department of Public Works;
- Proceed with efforts to develop a Zero Waste Policy;
- Actively engage Scholl Canyon Wasteshed Cities in efforts to develop a CT project at Scholl Canyon Landfill;
- Actively pursue and support critical legislation aimed at enabling the implementation of conversion projects, clean energy production, and emissions reductions;
- Establish a working group of key City staff and outside specialists to review all aspects of implementing a conversion project.

2.6 San Bernardino County

In response to AB 939, which established increased solid waste diversion goals, San Bernardino County formed the Solid Waste Advisory Task Force (SWAT). Within SWAT, a Strategic Planning Sub-Committee was formed to look at alternative reduction, recycling, composting and energy technologies and report back to the SWAT. The County is utilizing a three-step process to investigate the availability, suitability, and economics of municipal solid waste conversion technologies.

In January 2010, the County released a Request for Qualifications (RFQ) which will provide a list of technologies to be assessed by the County's consultant. All qualifications were due to the County in March 2010.

Currently, the Strategic Planning Sub-Committee is compiling a draft Alternative Reduction, Recycling, Composting and Energy Technology Report that will describe existing CT infrastructure, materials available, capacity for each facility and the differences between the facilities to handle various materials. A draft of this report is expected to be completed before the next SWAT meeting in April 2011. After evaluating CT company qualifications and existing projects, a Request for Proposals (RFP) will be prepared and released to assess the viability of siting a project(s) in the County and entering into an agreement for development.

3.0 STATUS OF NOTABLE CONVERSION TECHNOLOGY PROJECTS IN NORTH AMERICA

The following sections contain brief summaries of several of the most notable CT projects in various stages of development throughout North America.

3.1 Enerkem

Enerkem, as part of Enerkem Alberta Biofuels (EAB), has signed a 25-year agreement with the City of Edmonton, Alberta, Canada to build and operate a plant that will produce and sell ethanol from non-recyclable and non-compostable (MSW). As part of the agreement, the City of Edmonton will supply a minimum of 100,000 dry tons of sorted MSW per year to the facility. The sorted MSW to be used is the resulting material after recovering recyclables and compostables, which have been diverted.

The project met all required regulatory environmental standards (Alberta Environment), including air emissions, and was granted a permit to begin construction and operation of the commercial facility. Construction started during the summer 2010 and the facility is expected to begin commercial operations by the end of 2011.

Enerkem partnered with the City of Edmonton and Alberta Innovates – Energy and Environment Solutions to secure funding for the project. In addition, the project has been selected by Alberta Energy to receive $3.35 million in funding, as part of the Biorefining Commercialization and Market Development Program. This program is designed to stimulate investment in Alberta's bio-energy sector.

In partnership with the City of Edmonton and Alberta Innovates, this facility will enable the City of Edmonton to increase its residential waste diversion rate to 90 percent.

TABLE 3-1
PROJECT SUMMARY FOR ENERKEM ETHANOL PLANT
EDMONTON, ALBERTA, CANADA

Developer	Enerkem, as part of Enerkem Alberta Biofuels
Location	Alberta Waste Management Center Edmonton, Alberta, Canada
Participants	Enerkem, City of Edmonton, Alberta Energy, Alberta Innovates, Government of Alberta
Capacity	270 TPD
Feedstock	Presorted, non-recyclable and non-compostable municipal solid waste (MSW)
Technology Description	
Front-End Processing	Drying, sorting, and shredding of MSW
Primary Conversion Technology	Gasification
Back-End Conversion	Clean syngas and catalytic synthesis of syngas to liquid fuel,
Demonstration Plants	Pilot Plant, Sherbrooke, Quebec, Canada Advanced Energy Research Facility, Edmonton
Products	
Primary	Ethanol
Secondary	Methanol, acetic acid, acetates, renewable electricity, aggregates
Timing	Received permit in 2009 Construction began in 2010 Production expected at the end of 2011
Economics	
Capital Cost	$80 Million
Tipping Fee	$66/ton
Interesting Attributes	Expected to increase waste diversion by 90%, constructed in scalable modules with capacity of 10 million gal/yr each of ethanol.

FIGURE 3-1
AERIAL OF EXISTING ALBERTA WASTE MANAGEMENT CENTER

FIGURE 3-2
RENDERING OF ENERKEM ETHANOL PLANT
EDMONTON, ALBERTA, CANADA

3.2 Plasco Conversion Facility

On September 5, 2008 Plasco Energy Group Inc. (Plasco) signed a contract with Red Deer County, Alberta, Canada to build a 200 ton per day waste processing facility. Plasco uses plasma technology to convert MSW into a syngas that is used to generate electricity. The waste stream will be comprised of MSW and industrial, commercial, and institutional (ICI) waste from the neighboring nine (9) communities. The Central Waste Management Commission (CWMC) was formed in 2007 to provide solid waste management services to these communities. More than 98% of the waste processed by Plasco will be diverted from landfill disposal.

Plasco will finance, build, own and operate the facility. Additional funding for the project has been provided by grants, including $10 million from the Climate Change and Emissions Management Corporation of Alberta. The project is in the permitting phase and construction of the facility is expected to be completed in 2012, with the facility operational by 2013. The facility is being built on land provided by Red Deer County. For the past three years, Plasco has operated a full-scale demonstration plant of 100 TPD capacity in Ottawa, Ontario, Canada. The plant is comprised of one complete Plasco "module".

TABLE 3-2
PROJECT SUMMARY FOR PLASCO CONVERSION FACILITY
RED DEER, ALBERTA, CANADA

Developer	Plasco Energy Group
Location	Red Deer County, Alberta, Canada
Participants	Central Waste Management Commission, Climate Change & Emissions Management Corporation
Capacity	300 TPD
Feedstock	Post-recycled MSW and ICI waste
Technology Description	
Front-End Processing	Separation of materials with high reclamation value, MSW shredded
Primary Conversion Technology	Gasification (Plasma)
Back-End Conversion	Sulfur, acid gases, and heavy metals removed from syngas Inert residue converted to aggregate product with plasma torch
Demonstration Plants	Ottawa, Ontario, Canada
Products	
Primary	Electricity, Syngas
Secondary	Recyclables, potable water, aggregate
Timing	Signed contract in 2008, Construction to be completed in 2012, Operational in 2013

Economics	
Capital Cost	$90 Million
Tipping Fee	$65-75/ton
Interesting Attributes	>98% of waste is diverted, constructed in 3 module format, Environmental Interpretation Center

FIGURE 3-3
RENDERING OF PLASCO CONVERSION FACILITY
RED DEER, ALBERTA, CANADA

FIGURE 3-4
PLASCO TRAIL ROAD DEMONSTRATION PLANT
OTTAWA, ONTARIO, CANADA

3.3 BIOFerm™ Energy Systems

In September 2010, The University of Wisconsin – Oshkosh began construction of a commercial dry fermentation anaerobic digester. The renewable energy facility will include heat and power generators and is expected to produce 5% to 10% of the campus's electricity and heat with an electricity output of over 3,000 MWh per year. The 8,000 tons per year feedstock for the facility will consist of organic waste provided primarily by campus and community sources, including leftover food and yard waste. The organic material will be loaded into four 70-foot chambers, each one 23 feet wide and 17 feet high. As the material decays, the biogas given off will be collected and burned in a generator that makes electricity. Excess heat can be piped into nearby campus buildings.

The project was developed in collaboration with the UW Oshkosh foundation, which purchased the land, and is partially funded with a grand of over $230,000 from Wisconsin Focus on Energy and a $500,000 grand from the federal government. The University is working with Boldt construction and BIOFerm Energy Systems to develop the fermentation facility. The facility will begin operations in April 2011, and will be the first AD facility taking source-separated MSW organics in the United States.

TABLE 3-3
PROJECT SUMMARY FOR BIOFERM™ ENERGY SYSTEMS
OSHKOSH, WISCONSIN

Developer	BIOFerm™ Energy Systems/Boldt Construction
Location	University of Wisconsin - Oshkosh
Participants	University of Wisconsin – Oshkosh, UW Oshkosh Foundation
Capacity	22 TPD (8,000 tons/year)
Feedstock	Source separated organic waste (yard and food waste)
Technology Description	
Front-End Processing	None
Primary Conversion Technology	Anaerobic digestion (dry fermentation)
Back-End Conversion	Biogas is cleaned and fired in internal combustion engine generators
Demonstration Plants	Several facilities throughout Europe
Products	
Primary	Electricity and heat
Secondary	Compost

Timing	Plans approved February 2010 Construction began September 2010 Operational April 2011
Economics	
Capital Cost	$2 Million
Tipping Fee	Unknown
Interesting Attributes	Modular construction, first AD plant in US receiving MSW organics

FIGURE 3-5
START OF CONSTRUCTION OF BIOFERM™ FACILITY
(UNIVERSITY OF WISCONSIN – OSHKOSH)

FIGURE 3-6
RECENT CONSTRUCTION PHOTO FROM BIOFERM™
(UNIVERSITY OF WISCONSIN – OSHKOSH)

FIGURE 3-7
RENDERING OF BIOFERM™ FACILITY
(OSHKOSH, WISCONSIN)

"Dry fermentation" refers to the fermentation of organic solids that can be tipped with up to 60% dry matter in airtight sealed digesters.

print

(1) Biomass (2) Mixing station (3) Digester (4) Gas cylinder (5) Heating technology
(6) Combined heat and power unit (7) Cooling/heat utilisation (8) Power feed into the grid

3.4 Zero Waste Energy

Zero Waste Energy (ZWE) and GreenWaste/Zanker have been working extensively with the City of San Jose, California to develop, permit, construct and operation a dry fermentation anaerobic digestion (AD) and in vessel composting (IVC) facility utilizing Kompoferm technology. The Kompoferm dry AD system and IVC are licensed exclusively to ZWE and the project will make San Jose the first city in the U.S. to use this technology.

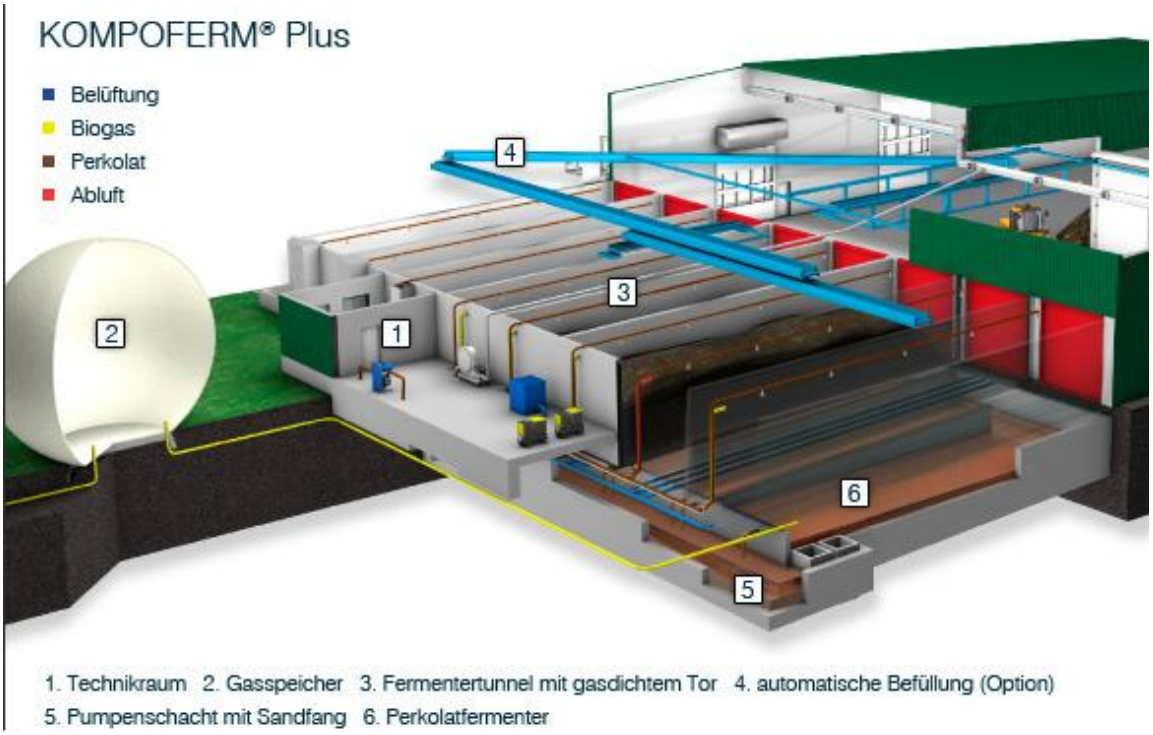
Once this three phase project is complete, the facility will process 150,000 tons per year of organic waste that would otherwise be disposed in a landfill. This increase in landfill diversion and production of renewable energy will help the City of San Jose to meet its economic development goals and reduce its per capita energy use. Biogas will be collected as a result of the fermentation process. This biogas may be used to make electricity for the utility power grid or compressed natural gas for fuel. The plans are being finalized and the facility will be under construction starting in 2011.

TABLE 3-4
PROJECT SUMMARY FOR ZERO WASTE ENERGY
SAN JOSE, CALIFORNIA

Developer	Zero Waste Energy/Bulk Handling Systems
Location	San Jose, California
Participants	GreenWaste Recovery, Zanker Road Resource Management, KOMPOFERM®
Capacity	410 TPD (150,000 tons/year)
Feedstock	Organic MSW fraction, source separated food waste
Technology Description	
Front-End Processing	MSW is separated at GreenWaste dirty MRF
Primary Conversion Technology	Anaerobic digestion (dry fermentation)
Back-End Conversion	Aerobic composting of remaining solids, biogas cleaned
Demonstration Plants	Several facilities throughout Europe (Germany)
Products	
Primary	Biogas (energy, CNG)
Secondary	Compost
Timing	Construction to begin in 2011 Operational late 2011

Economics	
Capital Cost	$20 Million
Tipping Fee	Unknown
Interesting Attributes	Will start at capacity of 50,000 tons/year and increase by 50,000 tons the following years, no financial commitment from city required

FIGURE 3-8
RENDERING OF KOMPOFERM® FACILITY
SAN JOSE, CALIFORNIA



3.5 Fulcrum Sierra BioFuels

Fulcrum Sierra BioFuels (LLC (Sierra BioFuels) is developing an MSW processing facility to generate ethanol in McCarran, Nevada (Reno area). Sierra BioFuels' process converts organic waste materials to ethanol utilizing a two-step thermochemical process. First, organic materials recovered from post-recycled MSW are gasified in a partial ozidation gasifier followed by a plasma arc. This step produces synthesis gas that is catalytically converted to ethanol in the second step, in a process developed by Fulcrum BioEnergy, Inc. Electricity will be produced as a secondary product and used at the facility.

The facility will process 300 tons per day waste material to produce approximately 10.5 million gallons of ethanol per year. Sierra BioFuels is expected to begin operating in late 2012 and has secured feedstock from Waste Connections in El Dorado County, California.

Additionally, Sierra BioFuels has recently entered the final phase of the U.S. Department of Energy's (DOE) loan guarantee program to secure funding for construction.

TABLE 3-5
PROJECT SUMMARY FOR FULCRUM SIERRA BIOFUELS
McCARRAN, NEVADA

Developer	Fulcrum BioEnergy Incorporated
Location	McCarran, Storey County, Nevada
Participants	Nipawin Biomass Ethanol New Generation Co-operative Ltd., Saskatchewan Research Council, Waste Connections Inc.
Capacity	300 TPD 10.5 million gal/year ethanol
Feedstock	Post-recycled MSW
Technology Description	
Front-End Processing	None
Primary Conversion Technology	Gasification and alcohol synthesis
Back-End Conversion	Separate and purify ethanol
Demonstration Plants	TurningPoint Ethanol Demonstration Plant, Durham, North Carolina
Products	
Primary	Ethanol
Secondary	Electricity
Timing	Construction to begin first quarter of 2011 Operational in late 2012

Economics	
Capital Cost	$120 Million
Tipping Fee	Unknown
Interesting Attributes	Cost for ethanol production is <$1 per gallon, feedstock contracted a fixed price

FIGURE 3-9
RENDERING OF FULCRUM SIERRA BIOFUELS PLANT
McCARRAN, NEVADA

3.6 INEOS BioEnergy Indian River BioEnergy Center

INEOS Bioenergy, a cellulosic ethanol technology vendor is developing a facility in Vero Beach, Florida that will process post-recycled MSW and forestry and agricultural waste. In addition to 8 million gallons per year of ethanol, six (6) MW of electricity will be produced, a third of which will be sold to the utility grid. Incoming waste will be dried and sent to a gasifier where it is converted to synthesis gas with the use of oxygen. The hot synthesis gas will pass through a heat recovery system to generate steam. The cooled synthesis gas is cleaned and sent to a fermentation system where it is converted to ethanol via bacterial metabolic action.

The project met all required regulatory environmental standards (Florida Department of Environmental Protection), including air emissions, and was granted a permit to begin construction of the commercial facility. The company began construction in November 2010 and is expected to be complete in early 2012 and operational in the second quarter. This project is partially funded by the U.S. DOE, which has selected INEOS Bioenergy to receive a cost-matching grant of $50 million.

TABLE 3-6
PROJECT SUMMARY FOR INDIAN RIVER BIOENERGY CENTER
VERO BEACH, FLORIDA

Developer	INEOS New Planet BioEnergy
Location	Vero Beach, Indian River County, Florida
Participants	INEOS Bio, New Planet Energy LLC, AMEC
Capacity	410 TPD (150,000 tons/year) 8 million gal/year bioethanol
Feedstock	Forestry and agricultural waste, vegetative yard waste and land clearing debris, and post-recycled MSW on a trial basis
Technology Description	
Front-End Processing	Drying
Primary Conversion Technology	Gasification and fermentation
Back-End Conversion	Syngas is quenched and cleaned and bioethanol is separated
Demonstration Plants	Research and Development Center, Fayetteville, Arkansas
Products	
Primary	Bioethanol
Secondary	Electricity
Timing	Site development began in November 2010 Construction to begin May 2011 Operational in 2012

Economics	
Capital Cost	>$100 million
Tipping Fee	Unknown
Interesting Attributes	U.S. Department of Energy selected facility for 50:50 cost-matching grant, facility located on a redeveloped closed industrial site.

FIGURE 3-10
RENDERING OF INEOS INDIAN RIVER BIOENERGY CENTER
VERO BEACH, FLORIDA

3.7 Grand Central Anaerobic Digestion

The Grand Central Recycling & Transfer Station is planning to site an AD project on their property using the UC Davis technology. The project is being developed by Onsite Power, who has the license for the technology, and is being sized at 250 TPD in the first phase. The plan allows for buildout in the future of a second 250 TPD phase. Feedstock will be a 50/50 blend of food waste and green waste.

Other partners include the Southern California Gas Company who will process and upgrade the biogas for injection into their gas distribution pipeline.

The project is in the early phases of site plan development and permitting.

TABLE 3-7
PROJECT SUMMARY FOR GRAND CENTRAL ANAEROBIC DIGESTION
CITY OF INDUSTRY, CALIFORNIA

Developer	Onsite Power Systems, Inc./Valley Vista Services
Location	City of Industry, California
Participants	Grand Central Recyling & Transfer Station, UC Davis, Onsite Power, Southern California Gas Co.
Capacity	250 TPD
Feedstock	Food waste and green waste
Technology Description	
Front-End Processing	Existing MRF
Primary Conversion Technology	Anaerobic digestion
Back-End Conversion	Biogas is cleaned for injection into distribution pipeline
Demonstration Plants	UC Davis
Products	
Primary	Biogas
Secondary	Compost feedstock
Timing	Estimated construction completion in 2012/2013
Economics	
Capital Cost	$5 million
Tipping Fee	Unknown
Interesting Attributes	Utilizes Anaerobic Phased Solids (APS) Digester system developed at UC Davis

FIGURE 3-11
ONSITE POWER SYSTEMS, INC. DEMONSTRATION FACILITY
DAVIS, CALIFORNIA

FIGURE 3-12
RENDERING OF ONSITE POWER SYSTEMS, INC. FACILITY

4.0 PERMITTING OVERVIEW (California)

The permitting situation in California related to CT projects can be divided into three tracks: anaerobic digestion (AD), gasification, and pyrolysis. These three categories make up virtually all the CT projects moving ahead in the U.S. and Canada.

AD projects have a clear permitting pathway under the composting regulations of CalRecycle. In addition, CalRecycle is completing a state-wide EIR for AD that should aid specific projects in navigating the CEQA process. The energy generated by these projects has already been designated as "renewable" by the California Energy Commission (CEC).

Gasification projects must meet a very strict set of criteria in state code in order to be defined as a "gasification" facility. The failed AB222 legislation was to have revised this code and created a clear permitting pathway; but it died in the last legislative session of 2010. However, over the past several months, gasification project developers have submitted project-specific requests to CalRecycle related to the gasification definition and have received affirmative responses. In addition, the CEC has recently revised their Renewable Energy Portfolio (RPS) Guidebook to state that with a positive ruling from CalReycle on the gasification definition, a project will be rated as RPS eligible by the CEC – meaning that the energy it generates will be considered "renewable". This is very important for the economics of these projects as renewable electricity is in demand and has a much higher value than non-renewable electricity. In addition, a "gasification" project also receives full diversion credit, as defined in statute. Thus all material converted by such a project would count towards participating jurisdictions diversion, not disposal.

Unfortunately for pyrolysis projects, there is no such definition to provide either renewable energy certification or diversion credit. As currently defined in statute, pyrolysis projects are defined as disposal, and the energy as non-renewable. This is not to say a project cannot be built, but it would have to be in a jurisdiction for whom more diversion is not an issue, and in which the economics of non-renewable energy would still be feasible.

It is anticipated that during 2011 the first commercial CT projects will enter the permitting process; most likely in Salinas, San Jose, the City of Industry, the County of Los Angeles, and/or Santa Barbara.

5.0 TIPPING FEES

Tipping fees depend on many factors including the type of technology, the type and value of end projects (electricity, fuel, etc.), revenue sharing, and many other contract issues. Although it is difficult to obtain project specific tipping fee information, especially for the private “greenfield” type projects, some information is becoming available through the public competitions and projects as follows:

- Typical Tipping Fee ranges from competitions:
  - AD: $60-$100
  - Gasification and pyrolysis: $65-$150
- Project specific tipping fees:
  - Enerkem (Edmonton): $66/ton
  - Plasco (Salinas): $70-80/ton

Over the next year, once final contracts have been signed on several more projects, the tipping fee picture will become clearer.

6.0 CONCLUSION

CT projects continue to move forward in North America. Of most importance is the start of construction of three projects: Enerkem (Edmonton), BIOFerm™ (Oshkosh), and INEOS (Vero Beach).

The key factors that have slowed development of the MSW CT projects are:

- Cost (versus continued, relatively inexpensive landfilling),
- Perceived risk, and
- Financing (particularly during the recession)

However, at least in several instances, these barriers have barriers have been overcome.