DOCKETED

Docket Number:	00-AFC-14C
Project Title:	El Segundo Power Redevelopment Project Compliance
TN #:	201717
Document Title:	Data Responces 2/12/14 from NRG
Description:	E-mail
Filer:	Christine Stora
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	2/12/2014 2:44:45 PM
Docketed Date:	2/12/2014

Stora, Christine@Energy

From: Piantka, George [George.Piantka@nrgenergy.com]
Sent: Wednesday, February 12, 2014 1:34 PM
To: Stora, Christine@Energy
Cc: Miller, Elena@Energy; Marxen, Chris@Energy
Subject: RE: ESEC Outstanding Information Update Needed
Attachments: MBC ESEC Bio Closeout Report Feb 2014.pdf; MBC ESEC Bio Closeout Report 2011 2012.pdf; ESEC_00-AFC-14C_HAZ-3-RMP_01-18-13 .pdf; Revised Table 2-14 HazMat Use and Storage ESEC PTA 00-AFC-14C 02122014.docx

Christine,

I understand and appreciate the need to close these data requests to meet the PSA publication date. We are very appreciative of the patience of Staff in working with us. I do not have complete responses to the questions below. We are still waiting for the Cultural Resources Report and we are developing a schematic referenced in question #6. Nonetheless, here are the responses to those questions we can address. I am open to follow up with you and your team with these responses. Thank you.

1. Biological Resources needs the Construction Termination Reports.

   Response – A Construction Termination Report was not specifically identified as a condition in the license for this project, but such a report was primarily linked to and predicated on the beach delivery (i.e., BIO-9), which was not performed. However, we did perform biological monitoring in 2013 as noted in the first attached report that was submitted at substantial completion of construction activities; as noted the observation were along the perimeter and associated with bike path area work. We also documented monitoring/observations in 2011 and 2012, as summarized in the second attached report. These reports are representative of annual reporting in accordance of BIO-7.

2. Cultural Resources still needs the report from JMA Consulting (records search results (copies of studies and site record forms), and map(s) depicting the records search results).

   Response – We are still waiting for JMA's Cultural Resources Report. Our intent is, still, to provide those available portions (text, maps, forms) of the report to aid Staff with the completion of the Cultural Resource section of the PSA. I will have another update on Thursday.

3. HazMat still has the following data needs below:
   1. The list of hazardous materials that would be used at the modified ESEC is found on Table 2-14 of the PTA. Is this 100% complete?

      Response – To the best of our knowledge at this time, Table 2-14 is complete and provides a list of chemicals anticipated to be used for the El Segundo Power Facility Modification (ESPFM), with the exception that as noted in responses to Questions 2 and 3 below.

   2. As previously discussed, the entry in the Table 2-14 listing aq. hydrazine is in error and no hydrazine will be used or stored at the ESEC. Correct?

      Response - That is correct; no hydrazine will be used or stored at ESEC.

3. The list of chemicals for environmental control systems found in Table 2-17 appears to be duplicative of those chemicals found in Table 2-14. Correct? Or are the Table 2-17 chemicals in addition to those listed in Table 2-14?

   Response - Except as noted in this response, the chemicals, usage rates, purpose and maximum storage rates listed on Table 2-17 are also included on Table 2-14 and are duplicative. Table 2-17 provides the chemical and usage/storage rate associated with emission control and monitoring equipment, while Table 2-14 provides the list for construction and all operations. Note that there are a couple of apparent errors or omissions on Table 2-14; we have made those corrections. Namely, aqueous ammonia (19%) in Table 2-14 is for pH control for Units 6 and 8 (boiler make up) and is stored in stainless steel totes; the final design for the totes is 350 gallons each – one per combined cycle train, and we will plan to install a third tote 350 gallon tote for the GE CC Fast Units 9 and 10. Aqueous ammonia (29%) in Table 2-17 is for emission control and is stored in the existing 20,000 gallon UST located near the entrance; the daily usage should be up to 1,500 gals – not 15,000 gallons as referenced in the table.

   Also, Sulfur hexafluoride was listed on Table 2-17, but not on Table 2-14. It should have been listed in Table 2-14 instead.

   Updated Table 2-14 is included herein.

4. Despite at least two references to it in the PTA, there is not now and will be no ammonia pipeline used in the future. Correct? All ammonia will be delivered via tanker truck or tote delivery. Correct?

   Response - That is correct. No ammonia pipeline was or will be constructed. It was removed from the project description via the 2012 approved PTA. Also, it is correct that ammonia (29%) will be delivered via tanker to fill the 20,000 gallon UST, or by truck delivery (for the 19%) to fill the respective totes at Unit 5-8 for ESEC and Units 9 and 10 for GE CC Fast for the ESPFM.

5. Aq. ammonia will be used and stored at two locations on the site: 1000 gal steel drum or tote south of the Unit 4 Boiler and a 20,000 gal underground tank at the top of the hill. Correct? Please identify where the "top of the hill" is located and show on a map of the site.

   Response - Ammonia for Units 4 boiler's SCR and ESEC Units 5 and 7's SCRs is supplied from the existing double-walled 20,000 gallon UST, which contains 29% ammonia. The 20,000 gallon UST is located near the entrance to the plant (see the attached current Risk Management Plan). This tank was documented in the original AFC (and the Decision) as the supply for ammonia for the El Segundo Power Redevelopment Project's 2x1 combined cycle plant and for steam boilers Units 3 and 4. With the completion of construction of ESEC Units 5-8, the existing 20k gallon UST continues as the ammonia supply for Units 5 and 7 SCRs and for Unit 4 SCR. Two ammonia totes of 350 gallon capacity each (stainless steel within secondary containment) storing 19% ammonia were installed to provide pH control to Units 6 and 8 boiler feed. The final design of these totes is 350 gallons each and will be filled to 320 gallons each; this is a change from what is referenced in the current RMP. The 1000 gallon capacity tote or drum referenced in your request was the initial anticipated capacity for 19% ammonia storage, but following detailed design, stainless steel totes of 350 gallon each was manufactured

and installed. The totes were recently placed at the site and are being commissioned, hence replacing smaller temporary totes that have supported ESEC during its initial operating months. A revision to the RMP is in process to reflect the final tote design. For ESPFM, we intend to install another 350 gallon tote within secondary containment to support pH control for the GE CC Fast combined cycle unit.

6. Please provide a schematic diagram of the two locations of aq. ammonia storage showing the drums/totes and underground tank (what is the depth of the tank bgs?), and secondary containment and tanker transfer pads. Is the underground tank double-walled which would serve as the secondary containment?

   Response – Attached is the 2013 RMP with figures that depict the location of the 20,000 gallon double walled (for secondary containment) UST that stores 29% aqueous ammonia to supply the facility's SCR systems; the UST is near the plant entrance off of Vista Del Mar Blvd and the offloading pad is located adjacent to the UST location. A figure depicting the locations and sizes of the two aqueous ammonia totes and their respective secondary containment is being developed. The current RMP does not reflect the 350-gallon stainless steel totes. We are in the process of updating the RMP.

7. Please provide any Off-site Consequence Analysis for the aq. ammonia storage areas, if you conducted one.

   Response – the Off-site Consequence Analysis is included in the attached RMP. As noted, the worse-case release scenario is attributed to a release of 29% aqueous ammonia from the delivery line from the UST to the ammonia skids associated with the SCR systems.

8. What is the maximum number of trips of aq. ammonia tanker trucks to the facility and the preferred and secondary transportation routes?

   Response - In support of ESEC Units 5 and 7 SCRs and steam boiler Unit 4 SCR, the 20,000 gallon UST is filled up to once a week. With the completion of the modernization of El Segundo, it is anticipated that the ammonia UST will be filled 1-2 times per week in support of Units 5-8 and 9-12. The UST will continue to be filled with 29% aqueous ammonia via a 5,000-gallon tanker. The totes will be filled with 19% aqueous ammonia from a smaller ammonia supply truck; we anticipate filling the totes once every 3 to 6 months. The ammonia supply vehicles will continue to approach the site from the north along Vista Del Mar Blvd. It will access Vista Del Mar Blvd from Imperial Highway, followed the approved truck route discussed in the ESEC license.

From: Stora, Christine@Energy [mailto:Christine.Stora@energy.ca.gov]
Sent: Tuesday, February 11, 2014 10:40 AM
To: Piantka, George
Cc: Miller, Elena@Energy; Marxen, Chris@Energy
Subject: ESEC Outstanding Information Update Needed

George,
I just wanted to check in again and find out the status of the data needs that staff still has. Without this data staff can't fill all the data gaps in the PSA and we are starting to bump up against my deadlines in order to publish by 2/27. In our last meeting on 1/23/2014, we all agreed to wait until

these data gaps are filled before publishing the PSA. Depending on when this information is available I may need to push out the PSA publication date to insure that the information we are waiting for is incorporated into the PSA.

Here is my current list of the outstanding items that staff have been previously requested by staff.

1. Biological Resources needs the Construction Termination Reports
2. Cultural Resources still needs the report from JMA Consulting (records search results (copies of studies and site record forms), and map(s) depicting the records search results)
3. HazMat still has the following data needs below:

    1. The list of hazardous materials that would be used at the modified ESEC is found on Table 2-14 of the PTA. Is this 100% complete?
    2. As previously discussed, the entry in the Table 2-14 listing aq. hydrazine is in error and no hydrazine will be used or stored at the ESEC. Correct?
    3. The list of chemicals for environmental control systems found in Table 2-17 appears to be duplicative of those chemicals found in Table 2-14. Correct? Or are the Table 2-17 chemicals in addition to those listed in Table 2-14?
    4. Despite at least two references to it in the PTA, there is not now and will be no ammonia pipeline used in the future. Correct? All ammonia will be delivered via tanker truck or tote delivery. Correct?
    5. Aq. ammonia will be used and stored at two locations on the site: 1000 gal steel drum or tote south of the Unit 4 Boiler and a 20,000 gal underground tank at the top of the hill. Correct? Please identify where the "top of the hill" is located and show on a map of the site.
    6. Please provide a schematic diagram of the two locations of aq. ammonia storage showing the drums/totes and underground tank (what is the depth of the tank bgs?), and secondary containment and tanker transfer pads. Is the underground tank double-walled which would serve as the secondary containment?
    7. Please provide any Off-site Consequence Analysis for the aq. ammonia storage areas, if you conducted one.
    8. What sis the maximum number of trips of aq. ammonia tanker trucks to the facility and the preferred and secondary transportation routes?

Please provide me with an update on these outstanding items so that I can work with staff to complete the PSA.

Thank you,

Christine R. Stora
Compliance Project Manager
Direct: (916) 654-4745 | Fax: (916) 654-3882
Christine.Stora@energy.ca.gov

CALIFORNIA ENERGY COMMISSION
Siting, Transmission, & Environmental Protection (STEP) Division
1516 Ninth Street, Sacramento, CA 95814
www.energy.ca.gov

Seipel, Scott

Subject: FW: ESEC - 00-AFC-14C COC HAZ-3 RMP
Attachments: ESEC_00-AFC-14C_HAZ-3-RMP_01-18-13 .pdf

From: Scott Seipel <sseipel@thesourcegroup.net>
Date: Friday, January 18, 2013 8:47 PM
To: "Dyas, Mary@Energy" <Mary.Dyas@energy.ca.gov>
Cc: George Piantka <George.Piantka@nrgenergy.com>, Tim Sisk <Tim.Sisk@nrgenergy.com>, Nick LaPorte <Nick.LaPorte@nrgenergy.com>, "Skram, Michelle" <Michelle.Skram@nrgenergy.com>, Joni Boren <jboren@esec-cbo.com>
Subject: ESEC - 00-AFC-14C COC HAZ-3 RMP

Mary,

Please find attached the revised Risk Management Plan submitted in compliance with COC HAZ-3. ESEC has submitted the RMP to the City of El Segundo Fire Department for review and approval. A copy of the RMP has been placed in the El Segundo Library for a 45 day public review and comment period. ESEC will also provide a copy to the City of Manhattan Beach Fire Department for comment.

ESEC requests your review, comment and approval of the RMP. Once all comments have been received and incorporated into the RMP a final electronic submittal of the RMP will be made to USEPA.

Please call with any questions.

Scott Seipel, CHG
Senior Hydrogeologist
The Source Group, Inc.
Environmental Engineering, Hydrogeologic & Management Services
1962 Freeman Avenue
Signal Hill, CA 90755
562-597-1055 x115
909-648-5008 mobile
www.thesourcegroup.net

El Segundo Energy Center, LLC
301 Vista Del Mar Boulevard
El Segundo, CA 90245
Phone: 310.615.6028
Fax: 310.615.6060

January 18, 2013

Ms. Mary Dyas
Energy Facilities Siting Division
Docket No. AFC-00-14C
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

RE: EL SEGUNDO ENERGY CENTER PROJECT
DOCKET NO. 00-AFC-14C
CONDITION OF CERTIFICATION, HAZ-3
RISK MANAGEMENT PLAN REVISION

Dear Ms. Dyas:

El Segundo Energy Center LLC (ESEC) submits the attached revised Risk Management Plan (RMP) for review, comment, and approval in compliance with the AFC Docket No. 00-14C, Conditions of Certification (COCs) HAZ-3 for the ESEC Project located at 301 Vista Del Mar, El Segundo, California.

ESEC has submitted the revised RMP to the City of El Segundo Fire Department (CESFD) for review. ESEC will also provide a copy to the City of Manhattan Beach Fire Department for review and comment. A copy of the RMP is also available for public review in the City library located at 111 W. Mariposa Ave, El Segundo. The RMP will be available for public review for 45 days. ESEC will provide all comments received by the CESFD and any comments received from the City of Manhattan Beach Fire Department.

Once final comments are received and incorporated into the RMP, ESEC will prepare and submit electronically to USEPA.

If you have any questions or comments, please do not hesitate to contact me at (760) 710-2156.

Sincerely,

George L. Piantka, PE
Director, Environmental Business
NRG West Region

Enclosures: Risk Management Plan, El Segundo Generating Station

Cc: Robert Espinosa, City of Manhattan Beach, Fire Department
File

El Segundo Power, LLC.
301 Vista Del Mar Boulevard
El Segundo, CA 90245
Phone: 310.615.6028
Fax: 310.615.6060

January 17, 2013

Mr. Steve Tsumura
Environmental Safety Manager
El Segundo Fire Department
314 Main Street
El Segundo, CA 90245

Subject: El Segundo Power LLC , Risk Management Plan Revision

The El Segundo Power, LLC Risk Management Plan (RMP) has been revised to include the newly constructed ammonium hydroxide systems from the Repowering Project at El Segundo Power, LLC. These new systems tie into the existing ammonium hydroxide storage tank and go to each of the newly constructed units designated Units 5 & 7.

Enclosed please find two copies of the El Segundo Power, LLC RMP. The first copy is for your file and retention. The second copy is for the 45 day Public Review. The Public Review is to be held at the El Segundo Library and the RMP will be available for Public Comment. If after the Public Review period there are comments which need to be included, then the RMP will be revised to include the comments. Please note after the review period is over El Segundo Power, LLC, will then file the RMP electronically to the EPA via RMP Submit.

If you have any questions please contact Alex Sanchez at 310 615-6351.

Sincerely,

El Segundo Power, LLC
By: NRG El Segundo Operations Inc.,
It's Authorized Agent

By: _____
Ken H. Riesz, Sr.
Plant Manager

RECEIVED
JAN 17 2013
By

RISK MANAGEMENT PLAN

El Segundo Generating Station

301 Vista Del Mar Boulevard
El Segundo, California 90245

EPA RMP Facility ID# 1000 0010 2667

Unified Program 19-013-300011

Prepared For

NRG El Segundo Operations Inc.
El Segundo Power, LLC

January 15, 2013

Prepared By

URS Corporation
2020 East First Street, Suite 500
Santa Ana, California 92705
Phone: (714) 835-6886

URS Project Number: 29880137

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APPENDICES

1.0 Executive Summary *(§2745.3)*

This Risk Management Plan (RMP) describes the controls that the El Segundo Generating Station (ESGS) has developed to minimize the possibility of an accidental release of aqueous ammonia (NH_4OH) and to mitigate the effects of a release, should one occur, from causing immediate harm to the public and the environment. This RMP is formatted to follow the sequence of those sections (§) of the applicable Cal/ARP regulations found in Title 19 of the California Code of Regulations (CCR), Chapter 4.5.

- **Accidental Release Prevention & Emergency Response Policies *[§2735.3(a)].*** ESGS adheres to the safety and environmental policies of NRG and the related Safety Program and Environmental Policies and Procedures Manual. Policy dictates the commitment to conducting its operations in a manner that meets or exceeds all applicable environmental laws and regulations. Promoting compliance and environmental protection is the responsibility of each officer and employee. ESGS management continually stresses safe and environmentally sound operations in employee communications, training programs, written procedures and instructions. This includes this RMP and the referenced documents.

- **Stationary Source and Regulated Substance *[§2735.3(b)].*** ESGS is a gas-fired electric power generating station with two generating units known as Units 3 & 4. The process covered by this RMP is known as the Aqueous Ammonia System in which uses aqueous ammonia (NH_4OH) to control the emission of air pollutants from the combustion generating units and as a treatment additive for process water.

  ESGS is currently constructing the El Segundo Energy Center Project (ESEC) that will add two new power blocks with four new generating units (Units 5, 6, 7 & 8) to the existing Units 3 & 4. The existing Aqueous Ammonia System will be expanded by modifications known as the ESEC Modifications. This RMP incorporates the ESEC modifications into the existing RMP dated October 11, 2011 based on the engineering designs issued for construction. The ESEC Modifications will result in an overall decrease in the total quantity of NH_4OH handled at the site from that identified in the existing RMP.

- **Accidental Release Prevention Program & Chemical-Specific Prevention Steps *[§2735.3(c)].*** ESGS has developed a management system to plan, organize, implement and control this RMP and the Aqueous Ammonia System. The Station Manager is the primary person with this responsibility. Station operators are trained on the RMP elements, the process equipment, its monitoring, normal operation, and upset conditions that include responses to a release. A preventative maintenance program provides that the Aqueous Ammonia System equipment and instrumentation is inspected, tested, and/or maintained to function as designed. Modifications to the Aqueous Ammonia System require evaluation as defined by the Management of Change (MOC) procedure by knowledgeable and responsible parties to verify that they are made as designed and that new or modified safety and operating procedures as well as training is developed and implemented, as needed. New system descriptions, plans, procedures and training for the ESEC Modifications are under development as of the date of this RMP and will be completed prior to the startup of the new process equipment.

The design of the Aqueous Ammonia System is to the recognized and generally accepted good engineering practice using corrosion-resistance materials that are compatible with NH_4OH. Select safety features include the following:

- Continuous monitoring of critical process parameters by the Control Room (e.g., pressure, temperature, liquid flow, leak detection, etc.);
- Secondary containment with continuous leak detection monitoring of the annular space for the UST and pipeline segments outside the power blocks;
- Pressure relief valve (PRV) on the UST and supply pump discharge piping;
- UST equipped with flame arrestor, vacuum breaker, and overfill alarm;
- Ammonia vapor detectors located at the UST area, along the Units 3 & 4 Pipeline, and at the Units 3 & 4 SCR Skids that will alarm in the Control Room.

Detailed system descriptions, plans, procedures and training are available to the operators and maintenance personnel to ensure the consistent, accurate and safe operation. The previous RMP dated October 11, 2011 included the review and/or update of select documents. New system descriptions, plans, procedures and training for the ESEC Modifications are under development and will be complete prior to the startup of the new equipment.

- **5-Year Accident History *[§2735.3(d)].*** No accidental release of NH_4OH or ammonia at significant quantities as defined in the RMP regulation has occurred since the installation of the Aqueous Ammonia System in 1993.
- **Emergency Response Program *[§2735.3(e)].*** ESGS maintains written plans and procedures and provides training on the expected hazards and actions employees should take in response to an emergency, including an accidental release of NH_4OH. The emergency response program provides for evacuation, initial assessment, local and public agency notifications, emergency planning and coordination with outside agencies, personnel roles and the Incident Command System, and containment and removal actions, when safe to perform. The emergency response program defines the highest priority as protecting human health and is generally limited to defensive actions that station employees can perform safely. ESGS will rely on the El Segundo Fire Department and other local agencies as well as NRG contractors.

  A review and/or update of the emergency plans were included in the previous RMP dated October 11, 2011. For the ESEC Modifications, new or updated emergency procedures will be completed prior to the startup of the new equipment.
- **Recommendations to Improve Safety *[§2735.3(f)].*** A specific list of recommendations to improve safety is identified in Section 7.0, including updates to recommendations identified in the RMP dated October 11, 2011 that have were not complete as of this RMP update.

2.0 Introduction

2.1 Background

El Segundo Power, LLC has instituted this Risk Management Program (RMP) for the El Segundo Generating Station (ESGS), which it operates and maintains, in accordance with the California Accidental Release Prevention (CalARP) Program. The CalARP requirements are found in the California Health and Safety Code, Chapter 6.95, Article 2, Sections 25531-25543.3 and Chapter 4.5, Division 2, Title 19, California Code of Regulations (CCR). The El Segundo Certified Unified Program Agency (El Segundo CUPA) is responsible for overseeing the implementation of the CalARP Program for the City of El Segundo.

This RMP covers the storage and use of aqueous ammonia in the Aqueous Ammonia System at ESGS. Aqueous ammonia synonyms include ammonium hydroxide, aqua ammonia, or simply its chemical formula, NH_4OH. The original version of this RMP dates back to the time that the federal ARP program first became effective in 1999. This RMP incorporates modifications that will be made to the Aqueous Ammonia System based on design plans issued for construction.

2.2 Facility Description

ESGS is a gas-fired electric power generating station located at 301 Vista Del Mar Boulevard in El Segundo, California. Figure 1 provides a location map and Figure 2 provides a site layout map. ESGS consists of approximately 32.8 fenced acres surrounded by an 8-foot chain link fence topped with barbed wire. The electricity generated at ESGS is transmitted to the adjoining Southern California Edison (SCE) switchyard that is physically within the fenced boundary of the ESGS but is itself surrounded by its own fencing.

The only entrance to ESGS is from Vista Del Mar Boulevard through a locked gate which is monitored by a security officer and closed-circuit video surveillance camera 24 hours a day. The eastern portion of the site consists of a cut slope approximately 70 feet high that descends from Vista Del Mar Boulevard and the main entrance gate to the lower elevation of the power blocks. The predominant structures at ESGS include the power blocks with the generating units, ocean water intake/outfall structure, administration office trailers, several temporary construction trailers, paved roadways and parking areas, transformers, and the retention basin. The power blocks contain the turbines, generators, operator control room (Control Room), turbine lube oil system, air pollution control devices, multi-level steel boiler structures and multiple electrical transformers.

ESGS is bordered by Vista Del Mar Boulevard to the east and, opposite, the Chevron Refinery; 45th Street and a residential neighborhood in the City of Manhattan Beach to the south; Santa Monica Bay of the Pacific Ocean to the west; and Chevron Marine Terminal to the north.

2.2.1 El Segundo Energy Center (ESEC) Modifications

As of the date of this RMP, ESGS is in the construction phase of the El Segundo Energy Center (ESEC) project that will modify the Aqueous Ammonia System. The ESEC has been approved by the California Energy Commission (CEC), the lead state agency under the California Environmental Quality Act (CEQA). The ESEC will expand the generating capacity by adding two new power blocks with four new

generating units (Units 5, 6, 7 and 8) to the existing Units 3 & 4 power blocks. The units will be commonly monitored by the existing Control Room. Two of the new generating units will be natural-gas combustion units (Units 5 & 7) and will utilize the Aqueous Ammonia System in a similar manner as the existing Units 3 & 4. This RMP update incorporates the modifications to the Aqueous Ammonia System based on the available engineering designs.

For purposes of this RMP, the Aqueous Ammonia System will be categorized as the Existing Process and the ESEC Modifications as defined below.

- **Existing Process:** The existing Aqueous Ammonia System consists of a 29.4 percent solution of NH_4OH (29.4% NH_4OH) that is stored in a 20,000-gallon underground storage tank (UST). Supply pumps in the UST transfer the NH_4OH into a pipeline (the Units 3 & 4 Pipeline) that is connected to the following: 1) two selective catalytic reduction device evaporation skids (SCR Skid), one in each of Unit 3 and in Unit 4; and 2) the Unit 3 Chemical Feed Station, a water treatment unit.
- **ESEC Modifications:** The Existing Process will be modified by adding the following: 1) A new pipeline, known as the Units 5 & 7 Pipeline, will be connected to the existing UST and deliver NH_4OH to new SCR Skids; 2) Two new SCR Skids will be installed, one each in Unit 5 and Unit 7; and, 3) Two Ammonia Dosing Skids will be installed, one in each of the new power blocks, that will each have a 65 gallon container of 19% NH_4OH and the piping manifold and pumps that feed the water treatment additive to the de-mineralized water system used by Units 5, 6, 7 and 8.

2.3 Aqueous Ammonia System Description

Following is the overall description of the Aqueous Ammonia System that includes both the Existing Process and the ESEC Modifications.

- **Underground Storage Tank (UST):** The UST is located on the eastern slope of the property at a higher elevation (approximately 70 feet above mean sea level, msl) than the power blocks (approximately 20 feet msl) to which the pipelines run. Tank trucks operated by the chemical supplier deliver bulk 29.4% NH_4OH to the UST, a 20,000-gallon, double-walled, fiberglass reinforced plastic (FRP) clad, carbon steel tank. Figure 2 provides a site layout showing the location of the UST on the property. Figure 3 provides a drawing of the top of the UST that contains the various monitors, pumps, piping, etc. within a concrete secondary containment area and metal roof.

  Continuous leak detection monitoring consists of interstitial liquid sensors at each end of the bottom of the UST and ammonia vapor detectors that monitor the secondary containment area above the tank. Three UST supply pumps transfer the NH_4OH into the Units 3 & 4 Pipeline and/or Units 5 & 7 Pipeline based on the configuration of the Distributed Control System (DCS) in the Control Room.

- **Pipelines:** Supply pumps in the UST transfer the 29.4% NH_4OH into either or both of the Units 3 & 4 Pipeline or the Units 5 & 7 Pipeline that deliver it to one or more of the four SCR Skids, one within each of the combustion units (Units 3, 4, 5 and 7), and to the Unit 3 Chemical Feed Station. Figure 2 provides a layout of ESGS showing the approximately location of the pipeline and Appendix H shows the approximate length of the piping.

- Units 3 & 4 Pipeline. The pipeline consists of two-inch stainless steel service piping (also known as carrier piping) that extends from main header of the UST within the secondary containment area above the tank to each of the SCR Skids in Units 3 & 4 and to the Unit 3 Chemical Feed Station. The pipeline extends west downhill from the UST area, then south to a riser that drops the pipeline underneath the site access road. Opposite the road, a riser extends the pipeline aboveground to the west toward the retention basin and then north to a riser at the north end of the site access road. From there, the riser drops the pipeline underneath the road south of Unit 4 to a riser on the south portion of the Unit 4 power block.

    - Aboveground piping that is located outside the power blocks and the secondary containment area above the UST is within 4-inch polyvinyl chloride (PVC) containment pipe secured to a pipe rack shared with other piping. The containment pipe is clear PVC with a protective partial wrapping of sheet metal, allowing visible inspection of the annular space for leaks from the bottom.
    - Underground piping is contained within 4-inch carbon steel piping with an exterior corrosion-resistant coating with continuous liquid leak detection monitoring of the annular space.

    From the pipeline riser south of Unit 4, the 2-inch pipeline (no secondary containment) splits into three supply lines that run aboveground through the power block to: 1) the Unit 3 SCR Skid; 2) the Unit 4 SCR Skid; and, 3) the Unit 3 Chemical Feed Station.

    - Unit 3 and Unit 4 SCR Skid Supply Lines: The 2-inch pipeline continues from the Unit 4 riser to each unit's SCR Skid where it enters the smaller diameter piping manifolds of the SCR Skid.
    - Unit 3 Chemical Feed Station: Just after the riser south of Unit 4, the 2-inch pipeline branches into a 3/4-inch pipeline that extends north through the power blocks to the Unit 3 Chemical Feed Station.

- Units 5 & 7 Pipeline. The new pipeline will tie into an existing connection to the main piping header from the UST within the secondary containment area above the tank. From the connection, the pipeline will extend to the SCR Skid at Unit 5 and the SCR Skid at Unit 7. The pipeline will consist of 1-inch stainless steel service piping within an integral 4-inch containment pipe. The aboveground containment piping will consist of epoxy-coated carbon steel and the underground containment piping will consist of fiberglass-reinforced polyester (FRP). Continuous leak detection monitoring consists of a leak detecting cable within the annular space between the service piping and the containment piping along the entire length that will detect and locate a liquid leak.

  The pipeline will extend aboveground from its connection to the UST and then north around the SCE Switchyard, then along the retaining wall of the east slope to the northeast side of each unit. The pipeline branches east of both Unit 5 and Unit 7 into two underground portions that each extend west below the access road and power block to a riser located at the SCR Skid of each unit. The containment piping extends to the

riser at each SCR Skid where it terminates aboveground into the single-wall piping manifold of the skid.

- **SCR Skids:** Each SCR Skid in Units 3, 4, 5 and 7 are similar in design and function to vaporize the ammonia from the NH_4OH and inject it into the exhaust from the gas combustion turbines. A P&ID of the new Units 5 & 7 SCR Skids is provided in Appendix C (Drawing No. 21019-105-9).

  At each SCR Skid, the NH_4OH passes through a shutoff valve and piping to the vaporizer. In Units 3 & 4, the hot boiler (dilution) air from the pre-heater flows through two vaporizers on each SCR Skid. Atomizing nozzles in the evaporators spray the NH_4OH into the hot boiler air, which evaporates the ammonia. The air/ammonia mixture then flows to the SCR reactor unit located between the boiler economizer and air pre-heater. Flue gas exiting the economizer outlet of each unit's boiler economizer flows through the two parallel ammonia/air injection grids, one per air pre-heater, which inject the air/ammonia mixture into the flue gas that then flows into SCR reactor. The SCR reactor contains a horizontal flow catalyst bed where the NOx reacts with ammonia to form inert nitrogen gas and water.

  The Units 5 & 7 SCR Skids contain hot air fans that extract hot gas from the HRSG casing that flows into a vaporizer where it is mixed with ammonia vapors evaporated from the NH_4OH and mixes it with hot gas in the mixer. From the outlet of the mixer on the SCR Skid, the ammonia-gas mixture flows back to the HRSG which contains the ammonia injection grid that injects the ammonia-gas mixture into the HRSG exhaust gas and catalyst bed.

- **Unit 3 Chemical Feed Station:** The Unit 3 Chemical Feed Station uses 29.4% NH_4OH as a water treatment additive that is manually controlled. The Units 3 & 4 Pipeline delivers the NH_4OH to the Unit Chemical Feed Station where it terminates at a manually operated flow control valve. An operator must be present to hold open the dead-man valve on unit piping to initiate the filling of the transparent acrylic metering cylinder. Once filled to the appropriate level, the operator releases the dead-man valve, which springs closed and cuts off the flow of NH_4OH. The operator then opens one of two hand gate valves to gravity feed the NH_4OH into either the Unit 3 or Unit 4 mix tank that contain dilution water (two 50-gallon vertical carbon steel tanks). The mix tanks then pump the mixture into the suction boiler feed pump and/or discharge condensate pump that transfer it to the process water tanks.

- **Ammonia Dosing Skids:** The Ammonia Dosing Skid will meter 19% NH_4OH into the condensate pump discharge to control specific conductivity. Each of the two new power blocks will each contain an Ammonia Dosing Skid that will be within a Chemical Dosing Building, a 20-foot intermodal shipping container, located northwest of the condenser. Appendix C provides layouts of the Chemical Dosing Building (Drawing Nos. D-FC0166-M21C and –M11) and a P&ID of the Ammonia Dosing Skid (Drawing No. D-FC0166-M01).

  Each Ammonia Dosing Skid contains a 65 gallon container that will be connected by stainless steel braided hose to the ½-inch stainless steel piping manifold system. The container will be vented to an activated charcoal filter. The ammonia metering suction pumps (one primary and a backup) will start automatically on condensate flow (and stop on no flow), as needed, to maintain between 0.1 and 5 ppm ammonia in the condensate in the air-cooled condenser.

2.4 Program 2 Applicability *(§2735.4)*

The Aqueous Ammonia System is the only process at ESGS with more than a threshold quantity of a regulated substance listed in the CalARP requirements. The Aqueous Ammonia System has a maximum intended inventory of 41,483 pounds of ammonia in the form of NH_4OH as calculated in Section 6.1.2. Ammonia is listed in both Table 1 (Federal Regulated Substance List) and Table 3 (State Regulated Substance List) of the CalARP regulation. Based on the updated offsite consequence analysis described in this RMP, the distance to the toxic end point for the worst-case and alternative release scenarios are within the distance to public receptors . As such, the Aqueous Ammonia System is subject to Program 2 requirements of the CalARP regulations (19 CCR Chapter 4.5). However, it is not subject to the Process Safety Management requirements of either the federal regulation (29 CFR 1910.119) or the California regulation (8 CCR 5189), both of which apply only to solutions greater than 44% NH_4OH.

2.5 Registration and Submittal *(§2735.5)*

This RMP was developed, approved and implemented in close coordination with the El Segundo CUPA, who is the lead agency for implementing the Cal/ARP standards at the local level. This RMP will be registered with EPA using the online RMP*eSubmit software tool after it's final approval.

2.6 Program Management System *(§2735.6)*

At the core of the management system is the NRG Safety Program and the NRG Environmental Policies and Procedures Manual. Policy dictates the commitment to conducting its operations in a manner that meets or exceeds all applicable environmental laws and regulations. Promoting compliance and environmental protection is the responsibility of each officer and employee.

2.6.1 Person Responsible for this RMP

The Station Manager is the primary person with the responsibility to plan, organize, implement and control this RMP and the Aqueous Ammonia System. Station operators receive training on the RMP elements, the process equipment, its monitoring, normal and upset operation, and responses to upset conditions, including release. ESGS management continually stresses safe and environmentally sound operations in employee communications, training programs, written procedures and instructions. The preventative maintenance program requires that the Aqueous Ammonia System equipment and instrumentation is inspected, tested, and/or maintained to ensure that it functions safely and as intended. Planned modification of the Aqueous Ammonia System requires thorough evaluation following a management of change procedure that requires knowledgeable and responsible parties to verify that the modifications are properly designed using appropriate materials, and that new or modified safety and operating procedures as well as training is developed and implemented, as needed. New system descriptions, plans, procedures and training for the ESEC Modifications are under development as of this RMP and are to be complete prior to the startup of the new process equipment.

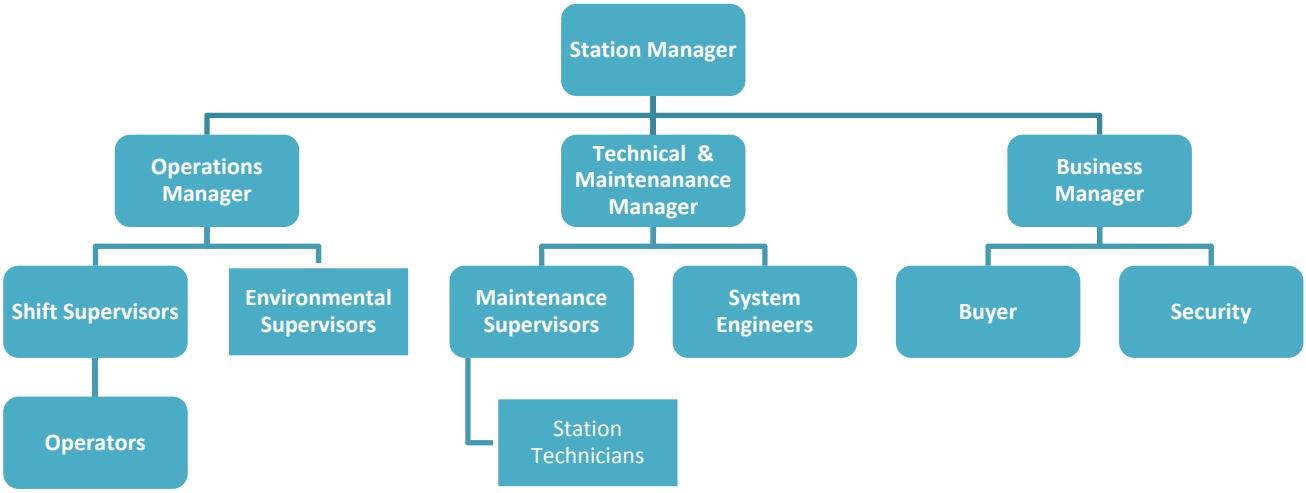
2.6.2 Qualified Position

The Station Manager has assigned the Environmental Supervisors as the Designated Qualified Position responsible for the development, implementation, and integration of the RMP at ESGS.

2.6.3 Organization Chart

The Station Manager has established lines of authority as depicted in the RMP Organization Chart below. The Station Manager may delegate specific responsibilities for one or more elements of this RMP as deemed necessary.

RMP Management System Organization Chart



3.0 Registration *(§2740.1)*

Table 3-1 identifies the information that will be included in the EPA RMPeSubmit registration of this RMP.

Table 3-1: RMP Registration

Name:	El Segundo Generating Station
Address:	301 Vista Del Mar Boulevard, El Segundo, California 90245
County:	Los Angeles
Latitude and Longitude:	33.90800 N, -118.422700 W *(location of UST as identified on MARPLOT)*
Facility Dun & Bradstreet (DUNS) No.:	127519580
Parent Company and DUNS No.:	NRG Energy, Inc., DUNS No. 793422213
Owner:	El Segundo Power LLC
Operator:	NRG El Segundo Operations, Inc.
Mailing Address:	Same as physical address
Telephone (24-hour):	(310) 615-6313
Person Responsible for RMP:	Ken H. Riesz, Sr., Station Manager
Emergency Contact 1:	Alex Sanchez, Environmental Coordinator 24-hour phone: (310) 529-3280 e-mail: alexander.sanchez@nrgenergy.com
Emergency Contact 2:	Steve Odabashian, Environmental Coordinator 24-hour phone: (310) 529-3281 e-mail: steven.odabashian@nrgenergy.com
Covered Process:	Aqueous Ammonia System
Maximum Quantity of Toxic Chemical:	41,483 pounds of ammonia (contained in 18,531 gallons of aqueous ammonia solutions of 19% and 29.4%)
Regulated Substance:	Ammonia (CAS No. 7664-41-7)
NAICS Code:	221112 (SIC Code: 4911)
CalARP Program Level:	2
USEPA Identifier:	CAR000037705
Number of Full Time Employees:	45 *(maximum number onsite at one time*)
Subject to Section 5189 of Title 8 CCR:	No
Subject to Part 355 of Title 40 of CFR:	Yes
CAA Title V Operating Permit No.	115663
Date of Last Safety Inspection:	June 18, 2012 *(El Segundo CUPA)*
Contractor Who Prepared the RMP:	URS Corporation 2020 East First Street, Santa Ana, California Phone: (714) 835-6886
Type and Reason for RMP :	Process modification

4.0 RMP Components *(§2745.1-2745.11)*

4.1 Applicability & Submission *(§2745.1)*

The Aqueous Ammonia System is the only process that handles more than a threshold quantity. As discussed in the Offsite Consequence Analysis, the toxic end point for a worst-case release scenario is within the distance to public and environmental receptors. As such, the Aqueous Ammonia System is subject to the CalARP Program 2 requirements. However, it is not subject to the Process Safety Management requirements of regulations of either the federal regulation (29 CFR 1910.119) or the California regulation (8 CCR 5189), which both apply only to 44% or greater NH_4OH solutions.

This RMP update has been coordinated with, and will be submitted to, the El Segundo CUPA for approval. The Registration to EPA last submitted on October 11, 2011 will be re-registered to reflect changes in this RMP prior to its finalization.

4.2 RMP Review Process *(§2745.2)*

This RMP is formatted to follow the general sequence of the applicable CalARP regulations. It has been reviewed by ESGS personnel and consultants knowledgeable with the CalARP requirements and the Aqueous Ammonia System. This RMP was developed, approved and implemented in close coordination with the El Segundo CUPA, who is the lead agency for implementing the Cal/ARP standards at the local level. This update has similarly been coordinated with, and will be submitted to, the El Segundo CUPA.

4.3 RMP Executive Summary *(§2745.3)*

Section 1.0 of this RMP provides an executive summary.

4.4 RMP Offsite Consequence Analysis *(§2745.4)*

Section 5.0 of this RMP discusses the offsite consequence analysis, including the worst-case and alternative release scenarios, the toxic endpoint, and the nearest public receptor.

4.5 RMP Five-Year Accident History *(§2745.5)*

There have been no accidental releases from the Aqueous Ammonia System that have resulted in deaths, injuries, or significant property damage onsite, or known offsite deaths, injuries, evacuations, sheltering in place, property damage or environmental damage.

4.6 Program 2 Prevention Component *(§2745.6)*

Section 6.0 of this RMP describes each of the prevention components.

4.7 Emergency Response Program *(§2745.8)*

ESGS has an Emergency Preparedness and Emergency Response Plan (EPERP) that was updated in 2012. The core elements of the plan include the following:

- Specific actions to be taken in response to an accidental release of NH_4OH, including evacuation and initial safe distance assessment;

- Procedures to notify, and phone numbers, of local and public agencies including the El Segundo CUPA, the Office of Emergency Services and the National Response Center, as necessary;
- Emergency planning and coordination with outside agencies;
- Emergency medical treatment and first aid;
- Information regarding the training of employees;
- Incident Command System and personnel roles;
- Emergency equipment;
- Containment and removal actions, when safe to perform.

The EPERP assumes the highest priority for protecting human health and is generally limited to defensive actions that station employees can perform safely. ESGS will rely on the El Segundo Fire Department and other local agencies as well as NRG contractors. A copy of the plan is available on the NRG server, in the Control Room, and in the offices of the Shift Supervisors and the Environmental Supervisors.

A review and update of the emergency plans was completed during the October 11, 2011 version of this RMP. The plans describe how ESGS has prepared for, and will respond to, an accidental release of NH_4OH. These plans include procedures for informing all onsite personnel, as well as the required notification of emergency response personnel (local fire department, state and federal agencies). New emergency operating procedures for the ESEC Modifications are to be complete prior to their startup.

Emergency response training is provided annually and as needed for new employees. The most recent training completed was in March 2012. Procedures for the use of emergency response equipment are included as part of each employee's safety training curriculum. Inspection, testing, and maintenance of emergency response equipment is included in the facility's preventative maintenance. The Station Manager is responsible to ensure the update of the EPERP, as appropriate, to maintain its effectiveness and to ensure that employees understand any significant changes to the plan.

The EPERP is intended to satisfy the emergency plan requirements of the following additional requirements: 1) OSHA Hazardous Waste Operations & Emergency Response (29 CFR 1910.120); 2) OSHA Employee Emergency Plan and Fire Prevention Plan (29 CFR 1910.38); 3) EPA Contingency Plan (40 CFR 265.50); and 4) El Segundo Power, LLC operating procedures and standards that define the procedures to effectively respond to natural or man-made events in a manner that addresses the safety and protection of employees, the public, and the environment.

4.8 RMP Updates, Corrections & Process Modification *(§2745.10 - §2745.11)*

This RMP will be routinely reviewed and updated as required by 19 CCR Sections 2745.10 (updates), 2745.10.5 (corrections) and 2745.11 (process modifications).

4.9 Certification Statement *(§2745.9)*

The undersigned certifies that, to the best of my knowledge, information and belief, formed after reasonable inquiry, the information submitted is true, accurate, and complete."

Name: Ken H. Riesz, Sr.
Title: Plant Manager

Signature: _____ Date: 1/17/13

El Segundo Power, LLC
By: NRG El Segundo Operations, Inc.
It's Authorized Agent

5.0 Hazard Assessment *(§2750.1-§2750.9)*

5.1 Applicability *(§2750.1)*

The sections that follow describe the hypothetical worst-case release scenario and the more probable alternative release scenario. Also included are the resulting offsite consequence analyses and the accident history of past releases at the site.

5.2 Offsite Consequence Analysis *(§2750.2)*

The offsite consequence analysis (OCA) is the evaluation of health and environmental impacts associated with the potential or actual release of ammonia from the Aqueous Ammonia System based on the worst-case release scenario and a more probable alternative release scenario. An evaluation of the release scenarios that could originate from the ESEC Modifications was completed and compared to the release scenarios identified in the RMP dated October 11, 2011.

5.2.1 Offsite Consequence Analysis Parameters and Modeling

ESGS evaluated the various release scenarios and release locations to identify the worst-case release and the alternative release scenarios as defined in the CalARP regulation. Based each release scenario, the toxic endpoint was identified using software provided by EPA for the RMP offsite consequence analyses, RMP*Comp, version 2.01. RMP*Comp was developed under the direction of the EPA to simulate the behavior of ammonia vapors that would evaporate from a NH_4OH release as it disperses into the atmosphere. RMP*Comp identifies the toxic endpoint distance as being the distance that ammonia vapors could travel before dissipating to the a level intended to be protective of the general public. For ammonia, the toxic endpoint is identified as 0.14 milligrams per liter (mg/L) based on the ERPG-2 Level of Concern (LOC) of 200 parts per million (ppm) established by the Emergency Response Planning Guidelines (ERPG) accepted by the American Industrial Hygiene Association (AIHA) as a basis for determination of offsite consequences.

The toxic endpoint identified by RMP*Comp for each release scenario was then used to estimate the radius of the toxic endpoint, centered at the release location, and the public and environmental receptors within the radius that would be affected. The analysis used additional software provided by EPA, known as MARPLOT® (version 4.2.2 released July 2012) that includes 2010 population data from the U.S. Census Bureau, to map the toxic endpoint radius and estimate the affected public and environmental receptors within the radius. The satellite photograph generated from MARPLOT® is included in Appendix D.

5.3 Worst-Case Release Scenario *(§2750.3)*

The CalARP regulation defines the worst-case release quantity for toxic liquids to be the greater of either the largest quantity held in a single vessel or pipe. ESGS evaluated the following scenarios and, based upon the information below, identified the worst-case release scenario as the catastrophic release of 29.4% NH_4OH from the Units 3 & 4 Pipeline at its liquid volume capacity.

- The largest vessel in the Aqueous Ammonia System is the 20,000-gallon UST although it does not represent the worst-case release scenario. A catastrophic release of its capacity is not applicable since it is located completely underground. Even if there were a release from the

UST, it would occur underground with minimal or no offsite toxic impact would occur from the emission of ammonia vapors. This is consistent with EPA guidance indicating that vessels sufficiently buried underground are passively mitigated that prevents their catastrophic failure and, as such, the failure of piping connected to the UST should be evaluated for the worst-case release scenario (General Guidance on Risk Management Programs for Chemical Accident Prevention, EPA 555-B-04-001, March 2009, page 4-12).

- The second largest vessel of the Aqueous Ammonia System is a fully loaded tanker truck delivering the material to the UST. EPA considers this to be in transportation and, as such, excluded from the definition of stationary source when attached to the motive power (e.g., a truck) that delivered it to the site (63 FR 643; January 6, 1998).
- The worst-case release quantity is the liquid capacity of the larger of the two pipelines, the Units 3 & 4 Pipeline, which is 277 gallons as calculated in Appendix H.

The worst-case release scenario of 277 gallons of 29.4% NH_4OH assumes that the release occurs at the lowest point in the aboveground pipeline (i.e., the bottom of the site access road) where it is most likely to result in the greatest volume release. As shown in the RMP*Comp report in Appendix D, this results in a toxic endpoint of 0.2 miles (0.3 kilometers).

5.4 Alternative Release Scenario *(§2750.4)*

ESGS has identified an alternative release scenario that is unlikely, but still probable, and could result in a significant release: The catastrophic rupture of the Units 3 & 4 Pipeline with two UST supply pumps operating at full capacity [7 gallons per minute (gpm)] and that goes undetected for 15 minutes before the Control Room shuts off the pumps. The scenario also assumes that NH_4OH continues to flow for another 45 minutes at a rate of five (5) gpm due to the static pressure of the liquid in the UST. The total time of 60 minutes conservatively estimates the time necessary to engage offensive actions to respond to the release by offsite assistance. This alternative scenario results in a release of 435 gallons of 29.4% NH_4OH or approximately 3,254 pounds (7.48 pounds per gallon for 30% NH_4OH at 60°F). Similar to the worst-case scenario, the alternative scenario release is assumed to occur at the lowest point in the aboveground pipeline (i.e., the bottom of the site access road). As shown in the RMP*Comp report for the alternative release scenario in Appendix D, this results in a toxic endpoint radius of 0.1 mile.

5.5 Offsite Impacts *(§2750.5 and §2750.6)*

The distance to the toxic endpoint concentration in the worst-case and alternative release scenarios was calculated to be 0.2 mile and 0.1 mile, respectively. The MARPLOT® satellite photograph showing the toxic endpoint radius resulting from the release scenarios is provided in Appendix D. There following public receptors and no residential populations were identified within the toxic endpoint distances:

- Worst-Case Release Scenario: Within the 0.2 mile toxic endpoint radius are located the public beach to the west (includes a California Coastal National Monument) and Vista Del Mar Boulevard and the Chevron Oil Refinery to the east.
- Alternative Release Scenario: Within the 0.1 mile toxic endpoint radius, are located both the public beach to the west and Vista Del Mar Boulevard to the east.

5.6 Offsite Consequence Analysis Review & Update *(§2750.7)*

The offsite consequence analysis described in Section 5.0 was updated using the most recent available modeling software available from EPA.

5.7 Offsite Consequence Analysis Documentation *(§2750.8)*

The documentation describing the offsite consequence analysis is provided in Section 5.0 of this RMP and the reports and satellite photographs in Appendix D.

5.8 Five-year Accident History

There have been no accidental releases from the Aqueous Ammonia System that have resulted in deaths, injuries, or significant property damage onsite, or known offsite deaths, injuries, evacuations, shelter in place, property damage or environmental damage.

6.0 Program 2 Prevention Components

The table below identifies specific information required for RMP Program 2 Prevention Program Components found at 19 CCR 2745.6. The remainder of this section provides additional information about the components.

Table 6-1: Program 2 Prevention Components

NAICS code:	221112 (SIC Code: 4911)
Toxic Chemical:	41,483 pounds of ammonia *(contained in 18,531 gallons of 19% and 29.4% NH_4OH)*
Safety information review date:	September 29, 2011
List of regulations, codes and standards:	Appendix G
Date of last hazard review update:	September 20, 2010 *(Existing Process)* October 4, 2012 *(ESEC Modifications)*
Hazard review findings completed:	December 31, 2013 *(Existing Process)* To be identified (ESEC Modifications)
Major hazards identified:	Toxic release
Process controls in use:	Vents, relief valves, check valves, manual and automatic shutoffs, interlocks, alarms and procedures, emergency power, grounding equipment, excess flow devices
Mitigation systems in use:	Dikes and secondary containment
Monitoring and detection systems in use:	Liquid and vapor leak detection
Changes since the last hazard review:	Proposed ESEC Modifications
Date of last review/revision of operating procedures:	October 6, 2011 *(Existing Process)* In development *(ESEC Modifications)*
Date of last review/revision of training programs:	March 2012 *(Existing Process)*
Date of last training:	March 22, 2012 *(Existing Process)*
Date of last review/revision of maintenance procedures:	August 10, 2012 *(Existing Process)*
Date of last equipment inspection or test:	March 2012 *(Existing Process)*
Date of last compliance audit:	September 27, 2011 *(Existing Process)*
Expected date of completion of audit recommendations:	December 31, 2013
Date of the last incident investigation:	There have been no qualified incidents.
Date of the last change that triggered a review/revision of safety information, the hazard review, operating or maintenance procedures, or training:	January 2012 *(ESEC Modifications)*
External events analysis:	See Section 6.2.
Last field verification that equipment is installed and maintained as designed:	September 2011 *(Existing Process)* In development *(ESEC Modifications)*

6.1 Safety Information *(§2755.1)*

Safety information has been compiled pertaining to the Aqueous Ammonia System to facilitate the understanding of the safety-related aspects of the equipment and processes, the limits thus placed on

operations, and the accepted standards and codes that have been adopted. ESGS maintains this RMP and the related plans, procedures, drawings and other related information in the onsite Administration Library and/or on the NRG computer server.

6.1.1 Hazards of NH_4OH

The section provides a summary of select hazards of NH_4OH as identified on the Material Safety Data Sheet (MSDS) prepared by the supplier, Airgas Specialty Products (Airgas). Appendix B provides a copy of the MSDS for the two different concentrations of NH_4OH (e.g., 5 – 19.9% and 20-30%).

NH_4OH is an alkaline material that is corrosive to human tissue in varying degrees depending on concentration and the time duration of exposure. Skin contact can cause severe irritation and burns. Eye contact with NH_4OH may be severely irritating. Ingestion can cause vomiting, nausea and corrosive burns to the esophagus and stomach with as little as 1 teaspoon.

Ammonia vapor may evolve from NH_4OH and is a colorless gas with a density just over half of that of air. The rate of vaporization increases with temperature, having a boiling point as low as 83°F. When spilled, NH_4OH will evaporate, releasing ammonia vapors to the surrounding atmosphere. Ammonia vapors from NH_4OH can be suffocating and irritating to mucous membranes and lung tissue. The easily recognized odor of NH_4OH provides adequate warning of its presence with its odor threshold of from about 5 ppm to 50 ppm. The California Occupational Safety and Health Administration (CalOSHA) has established a Permissible Exposure Limit (PEL) of 25 ppm of ammonia in air by volume as a time-weighted average (TWA) with a 15-minue short-term exposure limit (STEL) of 35 ppm. The National Institute for Occupational Safety and Health (NIOSH) has set 300 ppm of ammonia as it immediately dangerous to life and health (IDLH) value.

NH_4OH is not flammable but ammonia vapors present in NH_4OH storage and handling equipment can ignite in the presence of a flame or spark at about 1,200°F. The flammability range of ammonia vapor is approximately 16 to 25 percent in air by volume. A fire hose with fog nozzle is useful for controlling ammonia vapors originating from an accidental release of NH_4OH.

NH_4OH may react with halogens, hypochlorite, mercury, nitric acid and some organic compounds may form unstable, explosive and/or toxic compounds. It also dissolves many metallic oxides, hydroxides, and water insoluble salts as well as will react with many organic and inorganic compounds. Copper, zinc, cadmium and all of their alloys are incompatible with NH_4OH.

6.1.2 Maximum Intended Inventory

The ESEC Modifications will result in a decrease in the total quantity of NH_4OH handled at the site by approximately 550 gallons from that identified in the existing RMP dated October 11, 2011. The maximum intended inventory of NH_4OH at ESGS will be approximately 18,531 gallons (containing approximately 41,483 pounds of ammonia in the solution) as calculated below:

- 18,401 gallons of 29.4% NH_4OH: 18,000 gallons in the UST (20,000 capacity never filled beyond 90 percent, the set point of the high level alarm) + 277 gallon capacity of the Units 3 & 4 Pipeline + 124 gallon calculated capacity of the Units 5 & 7 Pipeline; plus,
- 130 gallons of 19% NH_4OH: Two Ammonia Dosing Skid containers.

The 18,531 gallons will contain approximately 41,483 pounds of ammonia as calculated below:

- (18,401 gallons x 7.48 pounds per gallon for 30 percent NH_4OH at 60°F = 41,292 pounds) + (130 gallons of 19% NH_4OH x 7.75 pounds per gallon for 19.2% NH_4OH at 60°F = 191 pounds).

6.1.3 Safe Upper and Lower Limits

Table 6-2 identifies a summary of the Aqueous Ammonia System design limits selected from the equipment specifications, limits and controls identified in the more detailed listing in Appendix G.

Table 6-2: Summary of Process Design Limits

Component	Normal	High	Low	Controls
Underground Storage Tank				
Liquid Level	3 - 8 feet	12 feet	2 feet	High level alarm set at 9 feet (90%).
Pressure	0 psig	50 psig (design)	-5.6 psig (vapor) -14.7 psig (design)	Relief valve @ 50 psig + Vacuum breaker @ 0.05 psig
Temperature	65 - 75 °F	150°F	32°F	Temperature gauge and transmitter.
Pipelines				
Pressure	70 psig	150 psig	-5.6 psig (vapor)	Relief valves set at 85 psig high + second pump activation at 40 psig low
Temperature	70°F	110°F	32°F	Temperature gauge and transmitter
Flow	0 – 5 gpm	7 gpm	0 gpm	No flow to SCR Skids interlocks pumps
Delivery Tanker Truck *(Supplier)*				
Pressure	0 psig	8 psig	-5.6 psig	Pressure relief valve
Temperature	70°F	120°F	32°F	Temperature gauge

6.1.4 Equipment Specifications and Safety Features

The Aqueous Ammonia System design incorporates recognized and generally accepted good engineering practices using corrosion-resistant materials compatible with NH_4OH, and features to minimize damage from significant hazards that could be caused by external events as identified in Section 6.2. Appendix C provides select design drawing of the Aqueous Ammonia System. Appendix G provides a list of major equipment descriptions, design codes and standards, features and release prevention controls. The system descriptions, operating and instruction manuals identify the specific equipment, specifications, operation and maintenance required and includes the equipment manufacturer's manuals for reference.

Safety features of the Aqueous Ammonia System include the following:

- Critical process parameters (e.g., pressure, temperature, liquid flow, leak detection, etc.) are continuously monitored by the Control Room that is monitored 24 hours daily by operators that can remotely shut-off critical flow control valves or the supply pumps in the event of an upset condition or a release.

- The UST design is to the ASME Pressure Vessel Code and the applicable requirements of the California Underground Storage Tank regulation, including pressure relief, vent flame arrestor, secondary containment, continuous interstitial leak detection monitoring, overfill controls, etc.
- Both the Units 3 & 4 Pipeline and Units 5 & 7 Pipeline designs are to ANSI B31.1 and consist of heavy gauge stainless steel that is highly corrosion resistant and compatible with aqueous ammonia. The rated capacity of the piping exceeds the process design limits and includes pressure relief valves at the supply pumps, shut-off and flow control valves, etc. Containment pipe with continuous leak detection of the annular space provides secondary containment for the carrier piping in portions outside the power blocks and in the underground portions.
- The NH_4OH piping on the SCR Skids and the Ammonia Dosing Skids designs are to ANSI B31.1 and consists of heavy gauge stainless steel piping. The Control Room continuously monitors critical process parameters (pressure, flow, temperature) and can remotely shut-off the NH_4OH supply flow using the DCS.
- The Unit 3 Chemical Feed Station has heavy gauge stainless steel piping designed to ANSI B31.1 and the vessels are either stainless steel or acrylic. NH_4OH flow from the pipeline requires an operator to manually hold open a dead-man valve and monitor the filling of the transparent acrylic metering cylinder.
- The Ammonia Dosing Skids design includes secondary containment and are inside a Chemical Dosing Building. The container and piping is heavy gauge stainless steel. The piping design is to ANSI B31.1 and the metering pumps have internal pressure relief valves. The container vent is equipped with an activated charcoal filter.

6.2 Hazard Review *(§2755.2)*

The initial hazard review of the Existing Process took place in 1999 in the form of a Process Hazard Analysis (PHA). Revalidation PHA reviews were completed in 2004 and 2010. Appendix E includes the reports that describe the methodology used, participating personnel, findings and recommendations identified. In summary, the review team used a checklist approach of What-If questions to analyze the potential hazards of the Aqueous Ammonia System relative to the available controls designed to minimize the realization of, or the magnitude of, the hazards. This included hypothetical consequences of hazard events (e.g., equipment malfunction, human error, external events, etc.). The two findings that were identified in the PHA report on are closed.

The initial PHA of the ESEC Modifications was completed September 5, 2012 and the report in included in Appendix E. The PHA was facilitated by Ammonia Process Safety Management, Inc. (Spencer Collins and Tyson Alexander) and the review team included ESGS Environmental Supervisors (Alex Sanchez and Steve Odabashian), ESGS Operations Manager (Robert Rea), ESGS Shift Supervisor (Dan Beebe), El Segundo CUPA Environmental Manager (Steve Tsumura), Airgas Supplier (Joe Ennes), and URS Corporation (LaVesta Kenison, Tariq Hussain, and Glenn Taylor). In summary, the review team used a checklist approach of What-If questions to analyze the potential hazards of the ESEC Modifications relative to the available controls designed to minimize the realization of, or the magnitude of, the hazards. This included hypothetical consequences of hazard events (e.g., equipment malfunction,

human error, external events, etc.). The findings have been included in the Recommendations to Improve Safety (Section 7.0) of this RMP.

In December 2012, the designs of the Ammonia Dosing Skid were modified to reduce the capacity of the totes from 400 gallons, as reviewed in the PHA, to 65 gallons. Since this was the only additional design change, the PHA was deemed to be effective without any update.

6.2.1 Seismic Assessment

ESGS is located in an area of moderate to strong seismic activity, classified as Seismic Zone 4 by the California Building Code. A seismic assessment update of the Existing System was completed in September 2010 following the Guidance for CalARP Program Seismic Assessment (Region 1 Local Emergency Planning Committee, September 2009). The Seismic Assessment Update for Risk Management Plan report (Haley & Aldrich, September 13, 2010) is included as Appendix F.

The report identified several recommendations to improve the reliability of the seismic support of the Aqueous Ammonia System, including improvements to conform to the 2010 California Building Code. Included in Appendix F is the Structural Review of Completed Ammonia Piping System Supports (Murashige & Onishi Engineering, September 12, 2011) that documents the completion of the recommendations deemed as not requiring immediate attention are still pending completion.

The ESEC Modifications are designed in accordance with the 2010 California Building Code (CBC). Upon completion of construction, an inspection will occur in accordance with Section 3 of the Guidance for CalARP Seismic Assessments (CalARP Program Seismic Guidance Committee, September 2009).

6.2.2 External Event Analysis

An evaluation of potential external events that could have an impact on ESGS was included in the planning documents of the ESEC Project. Following is a summary of external event analysis, which incorporates select information identified in the Application for Certification for El Segundo Power Redevelopment Project, El Segundo Power II LLC, December 2000.

- Aircraft Impact. This is not a significant hazard at the ESGS. The nearest commercial airports are Los Angeles International Airport, 2 miles north (up the coast), and Hawthorne Airport, 5 miles east (inland) of the site. Los Angeles International Airport has multiple runways with headings of 080-260 degrees (east or west), which will keep air traffic well north of ESGS. Hawthorne Airport has a single runway with headings of 080-260 degrees (east or west), which is in the direction of ESGS. ESGS is located upwind of Hawthorne Airport in the prevailing wind direction; however, it is far enough away to allow air traffic to vector clear of the facility.

  There is a potential for helicopter incidents at ESGS due to the significant amount of helicopter traffic that travels parallel to the coast, usually just offshore of ESGS. There has never been a helicopter incident at the ESGS or near it.

- Corrosion. This is a significant hazard at ESGS. The salty coastal atmosphere is corrosive to many materials. As such, the Aqueous Ammonia System (piping, tanks, instruments, valves, flanges, bolts, etc.) is made of corrosion-resistant materials throughout (e.g., stainless steel,

PVC, acrylic, carbon steel with a protective epoxy, etc.). Regular equipment inspection and maintenance mitigates the effects of salt corrosion.

- Extreme Winds or Tornadoes. This is not a significant hazard at ESGS. Based on climatological data from Los Angeles International Airport, the maximum peak wind gust ever recorded is 62 miles per hour, while the average wind speed over all hours and seasons is only 7.5 miles per hour. Coastal areas of California have occasionally observed water spouts (tornadoes over water) from time to time, but such occurrences are short lived and have, to date, never affected ESGS. The ESEC Modifications incorporate wind loads defined by the California Building Code as Basic Wind Speed 100 mph, and Exposure Category C.

- Fire. Fire onsite is a potential hazard at ESGS. The design and operation of ESGS reduces the potential for onsite fire affecting the Aqueous Ammonia System. The NH_4OH UST is located away from other station equipment and the surrounding areas are paved with asphalt/concrete or landscaping. Additionally, the nearest storage tanks containing flammable fluids are the tanks located on the Chevron Oil Refinery property directly across Vista del Mar Boulevard from ESGS, and are at least 400 feet from the Aqueous Ammonia System. In addition, the aqueous ammonia tank is underground, which will afford it some protection from the heat caused by a surrounding fire. However, the Units 3 & 4 Pipeline does travel near the natural gas metering station although there has never been a natural gas fire associated with the metering station.

  Brush fire, forest fire, and wildfire are not significant hazards at ESGS since the site is in an industrialized area away from brush or forest. No large areas of standing trees, brush, or other flammable vegetation are present near the site.

- External Flooding. This is a potential hazard at the ESGS. The site is located in Flood Zone "C," defined by Los Angeles County Flood Hazard Boundary Map as an area of minimal hazard, which is not susceptible to flooding. No external flood has ever affected ESGS and there has not been any major flooding in any area within city limits during the past 20 years.

  The coastal flooding potential is a hazard dependent on many factors occurring simultaneously. These include having an eroded shoreline, high tides, storm waves, low atmospheric pressure, and effectiveness of structural shoreline protection devices. ESGS is protected from the Pacific Ocean and storm damage by the existing Chevron rock groin and an existing rock revetment. No high tides have ever inundated ESGS. Particularly severe winter storm seasons, including the El Nino years of 1998, 1992, 1986, and 1982, eroded the beach on the ocean side of ESGS, but did not have an impact the facility itself. The ESEC includes a new 10-foot high perimeter seawall located along the westerly side of ESGS, the top of which will be 30 feet above mean sea level. A shoreline erosion monitoring plan is also to be developed.

- Internal Flooding. This is not a significant hazard at the ESGS. The nearest onsite water tank to the Aqueous Ammonia System is the distillate water tank located over 200 feet from the Unit 3 SCR Skid. A failure of this tank would result in a release of water, which would spread out in a plume toward the ocean and/or enter the storm water drainage system and away from the Aqueous Ammonia System.

- Fog. This is not a significant hazard at the ESGS. Fog occurs occasionally, forming over the cool ocean surface waters along the California coast and moving onshore in response to onshore surface pressure gradients. Based on climatological data from Los Angeles International Airport, which is considered representative of ESGS, reduced visibility (less than or equal to 1/4 mile) due to fog is reported on average 36.1 days annually. Fog occurs most frequently during the fall and winter months of October through January, primarily during the night and morning hours. The month with the maximum number of days of is December at 4.8 days with heavy fog.
- Hail. This is not a significant hazard at the ESGS. Thunderstorms that produce hail are extremely rare in the region. Based on climatological data from Los Angeles International Airport, thunderstorms occur on average only 4.2 days annually, and rarely with hail.
- Hurricane. This is not a significant hazard at the ESGS. Hurricanes in the eastern Pacific Ocean rarely affect the California coast as far north as ESGS. This is due to the site's latitude of nearly 34 degrees north, which is well outside of the tropical regions. Additionally, the colder water temperature along the California coast weakens storms of tropical origin, which require warm water to sustain their existence. As such, no extra-tropical storm of hurricane strength has ever made landfall in the ESGS vicinity.
- Industrial or Military Facility Accident. Industrial accidents near ESGS are possible due to the industrialized nature of the site vicinity. ESGS is bounded on the south by the Plains Marketing, LP pipeline tank farm and on the east by the Chevron Oil Co. Refinery. Industrial accidents at these facilities could potentially affect ESGS. No military facilities are within 5 miles of the ESGS. As such, the potential for an accident involving military facilities is considered insignificant.
- Lightning Strike. Lightning is not considered a significant hazard at ESGS since it is associated exclusively with thunderstorms, which are very rare and occur on average only 4.2 days annually based on Los Angeles International Airport climatological information.
- Liquefaction. This is a potential hazard at ESGS. Loose sands underlie much of the site and the potential for liquefaction is moderate to high. Subsidence of surface soils may be induced by either strong ground shaking from nearby earthquakes or by consolidation of loose or soft soils. The ESEC will include additional liquefaction analyses of the site.
- Meteoric Impact. Meteoric impact at ESGS is not a significant hazard since the probability of such an occurrence is comparable to anywhere else on the surface of the earth, and such an occurrence has never been recorded at the site.
- Nearby Pipeline Accident**.** This is a potential hazard at ESGS. Plains Marketing, LP operates a tank farm consisting of one small fixed-roof storage tank and ancillary facilities adjacent to the ESGS. The facility stores and routes petroleum products such as crude oil, fuel oil, and gas oil. A pipeline accident associated with this facility will not directly pose a significant hazard to the Aqueous Ammonia System since the pipeline is approximately 200 feet from the ammonia tank and at a lower elevation. Pipelines at the Chevron Oil Co. Refinery are nearly 400 feet away and are situated behind berms, which will confine leaks and prevent them from reaching ESGS. Additionally, the aqueous ammonia storage tank is underground, which will afford it some protection from heat.

- Precipitation. Intense precipitation at ESGS is not considered a significant hazard relative to its engineered drainage systems and the Aqueous Ammonia System is significantly elevated on the cut slope above the general station. Based on the National Oceanic and Atmospheric Administration (NOAA, Atlas 2, Vol. XI, Figure 41 Isopluvial Map), the 25-year, 24-hour precipitation event is approximately 6 inches. In addition, precipitation data from Los Angeles International Airport indicate that the maximum monthly rainfall is 12.71 inches, while the maximum 24-hour rainfall ever recorded was 6.19 inches.
- Release of Chemicals from Onsite Storage. This is a potential hazard at ESGS. A number of chemicals are stored at ESGS, including bottled compressed gases for maintenance activities (i.e. nitrogen, acetylene, and oxygen), sodium hypochlorite, ELIMINOX, mineral oil, lube oil, dielectric solvent, and various paints and solvents. Release of any of these chemicals would not directly affect the Aqueous Ammonia System but could potentially affect facility operators if their airborne plumes reach the Control Room. In the event this occurs, the ESGS Emergency Preparedness and Response Plan would be implemented, which includes emergency shutdown of the critical systems throughout the site and possible evacuation of site personnel.
- Sabotage. Sabotage of critical systems such as the Aqueous Ammonia System by disgruntled employees is possible at any industrial facility. Such acts of sabotage are controlled through employee training and screening procedures, including fitness for duty assessments of all employees. This, in addition to perimeter fences and onsite security presence and site access gate controls, discourages acts of sabotage. Critical valves on the Aqueous Ammonia System, which control the release of NH_40H, are locked in the normal position.
- Seismic. Strong earthquake ground shaking is a significant seismic hazard in the local area and has been taken into consideration as described in this RMP. There are no active faults known to cross ESGS, although a number of active faults lie within a 25-mile radius. ESGS has experienced strong ground motions in the past, and will do so in the future. Possibly the strongest shaking that has been observed at the site was completed during both the Sylmar moment magnitude 6.4 and the 1994 Northridge moment magnitude 6.7 earthquakes. ESGS was not damaged in the Sylmar event and only had minor damage to the wall adjacent to the beach bike path on the west side of the facility during the Northridge event.
- Slope Stability. The slope along the eastern portion of ESGS between the power blocks and Vista Del Mar Boulevard is identified as an area with landslide susceptibility where some ground movement may have occurred previously (DMG, 1999). The Aqueous Ammonia System is located on this slope and a large-scale slope failure could have significant impact. The man-made cut slope is approximately 70 feet high (without benching), and has an overall 1.75:1 (horizontal to vertical) inclination. Beyond the crest of the slope to the east are Vista Del Mar Boulevard and the elevated Chevron storage tank farm. The slope encompasses the entire east side of the site. Observed conditions of the slope indicate that relatively minor surficial sloughing, unraveling, and erosion have has occurred in the past during periods of heavy precipitation. However, in general, the slope has performed well since its original construction. Preliminary deep-seated slope stability analyses indicate stable static conditions. As part of the ESEC, the integrity of the cut slop will be evaluated.

- Shipwreck. A shipwreck along the Pacific Coast at ESGS would not present a significant hazard to the Aqueous Ammonia System. Because of the gradually sloping submarine terrain, a ship running aground would be well offshore of ESGS. Even an oil or chemical spill from the ship would not pose a significant hazard to the Aqueous Ammonia System, which is situated above plant grade and could be taken offline as a precaution. Additionally, offshore cooling water intakes are not at the sea surface, but at the ocean bottom several thousand feet offshore and would be unaffected by the spill even if it were to ignite.

- Extreme Temperature. Freezing winter temperatures, snow, frost, ice, etc. are not a significant hazard at ESGS. Based on Los Angeles International Airport climatological data, the absolute minimum temperature ever recorded at ESGS is 23°F, which is only 9 degrees below freezing; however, the average minimum temperature during the coolest month is only 47.8°F, well above freezing.

  High summer temperatures are not considered a significant hazard at ESGS since the Pacific Ocean acts as a moderating influence on the climate keeping maximum temperatures relatively cool the vast majority of the time. Based on Los Angeles International Airport climatological observations, the absolute maximum temperature ever recorded at ESGS was 110°F, well below the process design limits for temperature.

- Terrorist Attacks. Terrorist attacks are not considered a significant hazard since ESGS has no strategic significance unless in time of full-scale war. In addition, positive access to ESGS is controlled by perimeter fencing and by uniformed security guards. ESGS has never been the target of a terrorist attack. However, in the unlikely event of a terrorist attack, the Emergency Preparedness and Emergency Response Plan covers the actions required to protect employee and public safety and environmental wellbeing in event of an unplanned release.

- Transportation Accidents. Transportation in this discussion is limited to motor vehicles including cars, trucks, buses, etc. Traffic along Vista del Mar could potentially affect the Aqueous Ammonia System if a vehicle goes out of control and veers off the elevated road. The likelihood of this occurring is low. Vehicle traffic onsite is strictly limited to 5 miles per hour, including along the site access road. A traffic guardrail barrier or slope retaining wall is provided along the site access roads which also protects the pipeline. The area above the UST is protected by its location and traffic bollards located around the perimeter.

- Tsunami. The City of El Segundo Multi-Hazard Mitigation Plan (May 6, 2008) indicates that the tsunami threat to the City of El Segundo is considered low, although recent studies indicate a possibility that an offshore landslide could generate a tsunami that could threaten the coastal areas. No tsunami has ever adversely affected ESGS. The potential hazard at the site will be reduced as part of the ESEC project that includes a new 10-foot high perimeter seawall located along the westerly side of the site, the top of which will be 30 feet above msl.

- Turbine-Generated Missiles. Electricity is generated at ESGS using turbines that, because of the critical nature of their function, are kept in a high state of operability. All turbines are located on the inland side of the boiler units, the nearest being nearly 600 feet from the Aqueous Ammonia System UST enclosure. This, along with the fact that the tank enclosure is behind a portion of the coastal bluff, affords the Aqueous Ammonia System some protection from

hypothesized turbine missiles. Additionally, the turbines are encased in turbine casings that should contain any missiles that could potentially be generated upon catastrophic failure. To date, no turbine at ESGS has ever catastrophically failed that generated missiles. Although conceivable, this potential hazard is not considered likely.

6.3 Operating Procedures *(§2755.3)*

The system description, drawings and operating manuals identified in Appendix A identify the core operating procedures, including pre-startup inspection, normal startup, normal and emergency shutdown, troubleshooting and the instrument set-points. In addition, ESGS Orders and Procedures supplement the ESGS operating manuals with written procedures that provide instruction to operators, maintenance personnel, and NH_4OH truck drivers for safely conducting tasks and activities. At the time of this RMP update, new system descriptions, plans, procedures for the ESEC Modifications were being developed (e.g., the El Segundo Energy Center Operations Manual that contains operating procedures for SCR & Ammonia System (OP-503), Major Ammonia Leak (EOP-10), and Steam Cycle Chemistry (OP-405) which addresses the Ammonia Dosing Skid operation). Prior to the startup of the new process equipment, a pre-startup safety review of the SCR system will be completed to confirm that the construction is completed in accordance with the design plans and that the needed maintenance and operating procedures are in-place and adequate.

ESGS reviews the operating procedures as often as necessary to assure that they reflect current operating practice, including changes that result from technology and equipment. In addition, ESGS has developed and implemented safe work practices to provide for the control of hazards during operations, including lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a stationary source by maintenance, contractor, laboratory, or other support personnel. These safe work practices are required of employees and contractor employees.

6.3.1 NH_4OH Transfers

ESGS personnel supervise each UST delivery and/or removal of NH_4OH as described in Station Order EL A-122, Chemical/Oil Transfers and Deliveries. The chemical supplier, Airgas, requires the tanker truck driver to adhere to the Airgas Aqua Trailer Deliveries Operating Procedure, which requires minimum driver training (ammonia safety, first aid, HAZWOPER), procedures to stabilize truck, driver to be within reach of truck emergency shut-off during entire delivery, and use of personal protective equipment.

Delivery of 19% NH_4OH containers to, and their removal from, ESGS is by the chemical supplier who ensures that they meet U.S. Department of Transportation (DOT) requirements for hazardous materials. ESGS personnel supervise each delivery and/or removal as described in Station Order EL A-122, Chemical/Oil Transfers and Deliveries.

6.3.2 Maintenance

Maintenance procedures are developed and approved prior to the performance of the proposed activity in accordance with the Management of Change process. Records of maintenance is available on the NRG server or in the maintenance management software. The Technical & Maintenance Manager is responsible for the development of the necessary procedures, as needed, and for providing training to affected workers to ensure that they can safely perform the required activity. Recent examples of

maintenance procedures developed in 2012 include the following: 1) Procedure to replace Unit 4 west expansion joint gaskets; Ammonia Tank Cleaning Procedure (KBI); 2) Procedure to replace Unit 4 ammonia east west spray nozzle hoses (2012-NH3-0014); 3) Procedure to replace pump header relief valve (2012-NH3-0012); and, 4) Procedure to change out Unit 4 SCR Skid flow meter (2012-NH3-0011).

6.4 Training *(§2755.4)*

ESGS has instituted a comprehensive training program designed to ensure competency for personnel with responsibility for the operation and maintenance of the Aqueous Ammonia System. The training approach is a combination of both on-the-job training and classroom training to familiarize workers with the equipment, operating procedures and requirements. Plant managers, supervisors, and experienced operators provide on-the-job training to workers to provide them with the knowledge, skills, and abilities that they need to safely conduct their duties and responsibilities as provided in the operating procedures for the Aqueous Ammonia System.

- Operators currently must complete comprehensive training initially through a computer-based system, known as OMT. The OMT training is not specific to, but includes, the Aqueous Ammonia System. The OMT training covers descriptions, precautions, safety and environmental concerns, operating procedures (prestart, startup, normal, and shutdown), indications, controls, alarms, reference drawings and manuals. Successful completion of various tests taken during specific modules is required. Following the training, operators are required to demonstrate specific skills and knowledge to their supervisors through the Operator Check-Off process. Once this initial training is completed, operators are required to continue with the additional employee training and refresher training noted below. Prior to the startup of the ESEC Modifications, affected operators will be required to complete similar training on the new process and procedures that are under development as of this RMP update.

  Additional training on the proper operation, safety and responses to upset conditions for the ESEC Modifications for affected employees is to be complete prior to its startup. A pre-startup safety review of the ESEC Modifications will include confirmation that the needed maintenance schedules and procedures are in-place as prescribed by the equipment manufacturer, process design plan, and/or applicable industry standards.

- The Environmental Training Program requires that all ESGS personnel complete training on hazardous materials (identification, MSDS, storage, labeling, etc.), emergency response plans (emergency contact list, notification, evacuation, emergency procedures, use of emergency equipment, coordination with outside agencies). Additionally, operators, supervisors and maintenance, including contract employees, are required to complete classroom training on this RMP (overview, accident history, release scenarios, release prevention, chemical emergency response) and the tank and delivery system (controls, leak detector, gauges, fill procedures).

- Training will be required for employees involved with operating the Aqueous Ammonia System when it is determined that a process, procedure, equipment, or material has changed that would affect the operation of equipment.

- The Safety & Health Training Program requires supervision to ensure that training of employees who can demonstrate an understanding of issues before starting work, including completing job

hazard a safety analysis and change analysis of existing and new operations. Training of affected employees includes the various safety programs and procedures (e.g., contractor safety, emergency response, hazard communications, hazard reporting, hot work, lock out – tag out, PPE, preventative maintenance, etc.).

The Contractor Safety Program requires all contractors to abide by the program requirements and rules, including satisfying the NRG Corporate Procurement Policy on Qualified Suppliers, ensuring their workers and supervision are competent and trained for the type of work that they will perform.

- Airgas provides the training required for their chemical delivery drivers, which is summarized as follows: Drivers must have a Class A commercial drivers' license with hazardous material and tanker endorsements and training on emergency response, HAZWOPER, Airgas standard operating procedures for loading and unloading of anhydrous and aqua ammonia, emergency shutdown, Baume' testing of ammonium hydroxide.

6.5 Maintenance *(§2755.5)*

The ESGS operating and instruction manuals (Appendix A) identify the maintenance required for the equipment, including the equipment manufacturer's manuals for reference. Similar documentation is under development for the ESEC Modifications and is to be complete prior to the startup.

The Technical & Maintenance Manager is responsible for ensuring the proper maintenance of the equipment for reliability and developing safe procedures for performing the required tasks. Inspection and testing procedures follow recognized and generally accepted good engineering practices. The frequency of inspections and tests of equipment are consistent with applicable manufacturers' recommendations, industry standards, good engineering practices and prior operating experience.

ESGS employs a computer software program to identify required preventative maintenance in the form of work orders and track its completion. The equipment associated with the ESEC Modifications will be incorporated in a similar manner. Following is a select listing of preventative maintenance relative to the safety controls of the Aqueous Ammonia System:

- Daily Environmental Inspection Report completed by an operator and submittal to the Shift Supervisor. The report form requires inspection of the leak detector monitor, the UST pressure relief valve, the UST pressure, and the piping from the UST to the power blocks for corrosion, damage or leaks.
- Monitoring of the UST in accordance with the California Underground Storage Tank Regulations, including monthly UST inspections by a California UST System Operator, annual leak detection monitor certification by California UST Service Technician, and annual underground piping integrity test by a California UST Service Technician.
- Semi-annual inspection, test and calibration of the various instrumentation, including the gauges and transmitters (tank level, temperature, and pressure), by station technicians.
- Quarterly inspection of the relief valves and vacuum breaker certification.
- Quarterly inspection and test of the ammonia vapor detectors by a qualified contractor.

- Annual inspection, test and calibration of the SCR Skid instrumentation, including the gauges and transmitters (pressure, temperature, flow), by station technicians.
- Annual SCR Skid UPS System inspection and maintenance by station technicians.

6.6 Management of Change

When a proposed change has the potential to impact the Aqueous Ammonia System equipment or related procedures, the RMP Management of Change (MOC) form is required to be completed, reviewed and approved prior to the change. The only exceptions are: 1) equipment replacement in kind; 2) minor procedural changes that provide additional information or instruction designed to improve or enhance safety or release prevention controls. The MOC form for approving changes requires that knowledgeable and responsible parties verify that modifications are as designed and that safety and operating procedures (including RMP resources) are modified as necessary, notifications and training are provided to appropriate personnel, and time limits regarding temporary changes are followed.

The MOC form is required to be complete prior to every change to the ammonia system, whether temporary or permanent. The procedure requires that the appropriate ESGS personnel review and authorize the proposed change using a set form that includes questionnaires designed to assess the type of change and the potential impacts that change could have on the RMP resources.

6.7 Pre-Startup Safety Review

A pre-startup safety review is required to be completed prior to the initial startup of major equipment or the startup of a modification to existing equipment that is significant enough to require a change in the process safety information. The pre-start-up safety review will confirm the following information prior to the startup: construction and equipment is in accordance with design specifications; safety, operating, maintenance, and emergency procedures are in place and are adequate; and training of each employee involved in operating the process has been completed. The procedure also ensures that the Aqueous Ammonia System is returned to the normal operating condition after temporary changes are completed.

6.8 Compliance Audits *(§2755.6)*

Pursuant to 40 CFR §68.58 and 19 CCR §2755.6, the owner or operator shall certify that compliance with the provisions have been evaluated at least every 3 years in order to verify that the procedures and practices are adequate and are being followed. The most recent Compliance Audit was completed on October 5, 2011 by Ammonia Process Safety Management. At the time of this RMP update, the recommendations identified in the compliance report were undergoing evaluation by ESGS, which, once completed, will result in the identification of appropriate completion date(s).

6.9 Incident Investigation *(§2755.7)*

An incident investigation will begin within 48 hours for any accident involving aqueous ammonia that resulted in, or could reasonably have resulted in, a catastrophic release. At the conclusion of the investigation, a report will be prepared that will include the following information: 1) Date of incident'

2) Date investigation began; 3) Description of the incident; 4) Factors that contributed to the incident; and, 5) Findings and recommendations resulting from the investigation.

The findings and recommendations will be promptly addressed. Resolutions and corrective actions will be documented and reviewed with all affected personnel. A copy of the incident investigation report will be retained for 5 years. At the time of this RMP update, there were no records of incident investigations, as there have been no incident investigations during the last 5 years at ESGS. When an incident investigation occurs, items resulting from the investigation will be addressed promptly.

7.0 Recommendations to Improve Safety

This section summarizes the recommendations to improve safety identified during the development of this RMP update for consideration by ESGS.

7.1 Recommendations for UST, Units 3 & 4 Pipeline and SCR Skids

The following recommendations from the October 11, 2011 RMP are not complete:

1. Install secondary containment for the tanker truck unloading area to contain the entire capacity of the truck (6,000 gallons) plus 6 inches of rainfall (25-year storm), including containment for the transfer hoses.
2. Develop preventative maintenance to inspect the equipment for the proper identification tags (several were observed to be detached or missing).
3. Install a durable and clearly visible emergency shutoff sign or tag on manual valves at critical locations for quick field identification in an emergency.
4. Install emergency shutoff valves on the tank fill and vapor return lines to provide emergency shutoff of liquid flow during deliveries.

7.2 Recommendations for Units 5 & 7 Pipeline, SCR Skids and Ammonia Dosing Skids

The following recommendations have been identified based on information available and reviewed during the development of this RMP update.

1. Install vapor detectors to detect releases from single-wall piping components (e.g., SCR Skids, Chemical Dosing Buildings, NH_4OH piping from Chemical Dosing Buildings to condensers, pipeline connection between the aboveground to underground segments). Detector activation should alarm locally and in the Control Room. Include local signs (including on the doors of the Chemical Dosing Buildings) of what the alarm means and what response general site personnel are expected to take.

   Also, consider vapor detectors located in such a manner as to alarm if vapors threaten the Control Room, assuming no other means to determine at what point evacuation is necessary (otherwise, incorporate procedure that requires evacuation upon any odor in room).
2. Verify that all equipment and valves are safely accessible to personnel wearing chemical protective equipment during an emergency, particularly the Ammonia Dosing and SCR Skids.
3. Verify proper guarding of the Units 5 & 7 Pipeline where exposed to vehicle traffic and Chemical Dosing Building from vehicle collisions and forklift traffic.
4. Incorporate new equipment into the preventative maintenance program per the manufacturers manual, industry standard, or design. Examples include the following:
   a) Routine inspection of equipment markings and tags to ensure they are legible.
   b) Maintenance, testing, calibration and scheduled replacement of all instruments, valves, PRVs, solenoids, trips, etc. per manufacturer or applicable industry standard.

c) Consider establishing a regularly scheduled comprehensive inspection of the entire system by a qualified person (aboveground containment piping, flanges, end seals, corrosion, annular space for moisture, SCR Skid piping manifolds, Ammonia Dosing Skid manifolds and braided hoses/connections to container, etc.).

d) Routine inspection of the containment piping drains and annular air/insulation to verify a dry condition as required by the manufacturer.

e) Inspection or replacement of the Ammonia Dosing Skid activated charcoal filters on the vent line to replace the media as required by the manufacturer and the air pollution control permit.

f) Incorporate new equipment into operating procedures. For example, the UST Monitoring Plan (Station Order EL A-123), the Daily Environmental Inspection Report, the Locking of Critical Valves Station Order, Ammonia Dosing Skid braided hoses, etc.

g) If the container selected in the Ammonia Dosing Skid is portable, revise Station Order EL A-122 for Chemical Transfers to incorporate the safe delivery and transfer of NH_4OH containers, including its placement, setup and hookup/removal to/from the Ammonia Dosing Skid in a manner that prevent possible releases.

5. Document pre-startup safety review (see Section 6.7) and organize records to confirm construction is completed to the designs, the necessary operating, maintenance and emergency procedures are complete, the equipment is incorporated into the preventative maintenance program per manufacturer and applicable codes, personnel training is complete, installation testing is complete per manufacturer and codes, and that the controls are operating and functioning correctly.

   When complete, collect and provide all necessary records that demonstrate compliance with designs, equipment manufacturer instructions, industry codes, and applicable regulatory and code requirements. For example:

   a) Record of approval by independent testing organization for the design of the Units 5 & 7 Pipeline (23 CCR 2631).

   b) Ensure availability of drawings and specifications as “as-built” version.

   c) Include records that the installation and final check out of the system was approved by manufacturer’s technical field support per USA659-XW01-OOUZ-600024.

   d) Include records that the PermAlert PAL-AT Leak Detection and Location System has been approved by an independent third-party for aqueous ammonia (or all liquids) and that it is listed as such on the SWRCB LG 113 Leak Detection Equipment for UST.

   e) Include "UST Certification of Installation/Modification" form for both U/G and A/G piping systems [23 CCR 2636(c)]. Include records for "Inspection & Test Plan" (USA659-XW01-OOUZ-600024) - hydrostatic test per ASTM and ASME B31.1 NDE, certified material test reports for all service pipe materials, containment pipe air tested at 10 psig; service pipe hydrostatic pressure to 1.5 x operating press (149 psi) or Piping Line List for 2 hrs.

f) Include UST Monitoring System Certification form and Secondary Containment Testing Report per 23 CCR 2637 and 2638.

g) Upon completion of construction, complete a walkthrough inspection of the installation in accordance with Section 3 of the Guidance for CalARP Seismic Assessments (CalARP Program Seismic Guidance Committee, September 2009).

6. For the Units 5 & 7 Piping, document the minimum slope specification of piping to effectively drain liquids to the identified low point(s) and/or drains with liquid leak detection per 23 CCR 2636(c) or obtain written approval from El Segundo CUPA that the location cable leak detection system satisfies the requirement.

7. For the SCR Skids, identify specifications and design standard for the NH_4OH valves, flanges, gaskets, tubing, etc. on drawings (or reference specification).

8. For the Ammonia Dosing Skid design, provide the following or effective alternative:

   a) Verify and document the specifications and safety control features of the container (e.g. specification, pressure rating, PRV and set point, vacuum breaker and set point, etc.).

   b) A written statement of the specifications and compatibility of materials, including connections (threaded, bonded, etc.) and durability (breakage, transparency, etc.) to withstand 19% NH_4OH, of the liquid level sight glass that is shown on Drawing No. D-FC0166-M01 as Standpipe, SCH. 40, Clear PVC, Graduated.

   c) Identify specifications and design standard for the NH_4OH valves, flanges, gaskets, tubing, etc. on drawings (or reference specification), the adequacy of protection of the discharge line to the condenser tank to prevent accidental damage; and confirm that a check valve is available to prevent backflow into the NH_4OH tubing from the condenser.

   d) If the container selected is portable, evaluate and verify safety considerations for container placement and hookup by operators, including:

      1) Material handling of container and clearances for placement on skid;

      2) Seismic stabilization or bracing;

      3) Controls to safely isolate (valves) and bleed (drain to what containment) the two braided hose connections to the container to allow safe connection/disconnection without vapors or leaks;

      4) Controls to safely isolate and bleed the activated charcoal filter, PVC Graduated Standpipe (sight level gauge) and level switch pipe to allow for maintenance;

      5) Adequacy of the 12” length of the braded hose connection to facilitate hook-up (may need 18” or more).

   e) Identify the flow direction to/from activated charcoal filter (air intake as container is drawn down vs. adsorb ammonia vapors) on Drawing No. D-FC0166-M01. Evaluate the need for a check valve and/or PRV and the set point on the vent line to control flow.

f) Verify that the internal PRV on the Ammonia Metering Pumps discharge back to suction and not to atmosphere as suggested by the symbol on Drawing No. D-FC0166-M01. Also, verify that the relief valve cannot be manually isolated.

g) Verify the access, isolation and safe draining methods for the Chemical Dosing Building floor drains and the Ammonia Dosing Skid secondary containment drains in the event of an ammonia release.

h) Evaluate the need for an additional emergency shower/eyewash located immediately outside and safely away from the Chemical Dosing Building to accommodate response to an ammonia release inside or draining of contaminated water.

i) Document electrical classification statement for Chemical Dosing Building relative to the ammonia vapor hazard, ventilation, etc.

FIGURES

NRG Energy El Segundo Generating Station
301 Vista Del Mar
El Segundo, CA 90245-3650

0 0.5 mi 1 mi
Approximate Scale in Miles

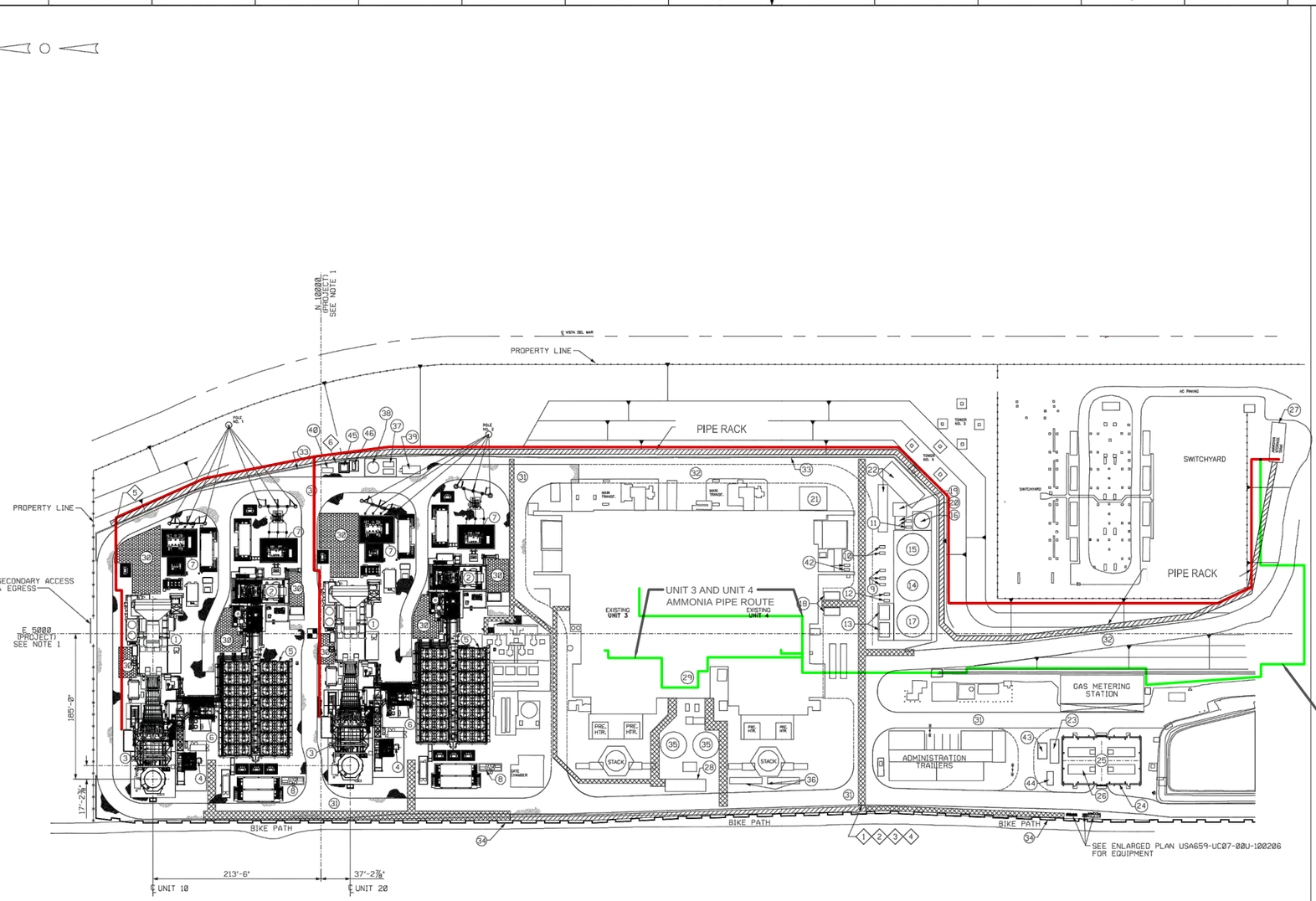
N

URS

Vicinity Map
El Segundo Generating Station

Proj. No.:	Date: JANUARY 2013
Project: Risk Management Plan	Figure: 1
Drawn by:	Checked by:

T:\2012\NRG\El Segundo\Figures\CAD\Vicinity Map.dwg , File date: 1/17/2013 2:01 PM , Print date: 1/17/2013 2:33 PM by: Lee, Jared



NOTES

1. PROJECT MONUMENT POINT N 10200.00, E 5000.00 ON DRAWING TITLED "SITE MONUMENT PLAN, DWG NO. USA659-UE00-00U-671601, BY WORLEYPARSONS, EQUALS THE ESTABLISHED PROPERTY MONUMENT POINT 0.00, 0.00 ON DRAWING TITLED "SURVEY CONTROL MAP FOR NRG EL SEGUNDO ENERGY CENTER." BY PSOMAS, 3 HUTTON CENTRE DRIVE, SUITE 200, SANTA ANNA, CA 92707.

PLANT LEGEND

1 11/21UMB/MKA - GAS TURBINE & GENERATOR
2 10/20MA/MKA - STEAM TURBINE & GENERATOR
3 10/20LHA - HRSG HEAT RECOVERY STEAM GENERATOR)
4 10/20LAC - BOILER FEEDWATER PUMP
5 10/20URC - ACHE (AIR COOLED HEAT EXCHANGER)
6 10/20LCB - DEAERATOR & CONDENSATE TANK
7 10/20BAT - ST GENERATOR TRANSFORMER
8 10/20SCA - AIR COMPRESSOR SKID
9 00UHC - DEMIN. WATER FORWARDING PUMPS
10 00GAF - RAW WATER FORWARDING PUMPS
11 00GAX - MIXED WATER FORWARDING PUMPS
12 SERVICE WATER FORWARDING PUMPS
13 00USG - FIRE WATER PUMPS
14 00UGC - DEMIN. WATER STORAGE TANK
15 00UGA - RAW WATER STORAGE TANK
16 00UGX - MIXING TANK
17 00UGF - FIRE WATER STORAGE TANK
18 00UGD - DEMIN SYSTEM EQUIPMENT (2 TRAILERS)
19 WATER PLANT TRANSFORMER
20 WATER PLANT MCC
21 00UYC - TEMPORARY MAINTAINENCE BUILDING (BY NRG)
22 00UYC - TEMPORARY MAINTAINENCE TRAILER
23 00EKE - FUEL GAS CONDITIONING SKID
24 00UEN - FUEL GAS COMPRESSOR BUILDING
25 00EKH - FUEL GAS COMPRESSORS
26 00URX02 - FUEL GAS COMPRESSOR FIN-FAN COOLERS (ROOF)
27 AMMOINA UNLOADING & STORAGE AREA (EXISTING)
28 RO TRAILER (PERMANENT LOCATION)
29 00UCA - EXISTING CONTROL ROOM
30 CRANE ACCESS/MAINTAINENCE AREA
31 00UZA - NEW ROADS
32 00UZA - EXISTING ROADS
33 00UZM - EXISTING RETAINING WALL
34 00UZ - NEW SEAWALL
35 CONDENSATE TANKS
36 I&E STORAGE
37 NITROGEN VAPORIZATION SKID
38 NITROGEN STORAGE TANK
39 HV REVENUE METERING ENCLOSURE
40 AUTOMATIC TRANSFER SWITCH PANEL
41 NOT USED
42 BLOWDOWN COOLER & PUMPS
43 FUEL GAS FILTER SKID
44 PILOT GAS FIN-FAN COOLER
45 CONSTRUCTION POWER TRANSFORMER
46 CONSTRUCTION POWER MCC

REFERENCES

USA659-UE00-00U-671601 - SITE MONUMENT PLAN
USA659-VA08-00UZ-671710 - ROADS,FENCE,AND SURFACING PLAN
USA659-UC07-00U-100201 SH2 - ENLARGED POWERBLOCK PLAN

SURFACE LEGEND

- ASPHALT PAVING
- OPEN GRADED AGGREGATE (OGA)
- DENSE GRADED AGGREGATE (DGA)
- ABOVEGROUND UTILITY CORRIDOR
- UNDERGROUND UTILITY CORRIDOR
- CUSTOMER TERMINAL POINT

CUSTOMER TERMINAL POINT LIST

TP	SIZE	DESCRIPTION	EASTING	NORTHING	ELEVATION
1	6"	RAW WATER (GAF)	E 4775'-6"	N 9318'-5 13/16"	EL. 19'-6"
2	6"	DEMIN WATER (GHC)	E 4775'-6"	N 9315'-11 13/16"	EL. 19'-6"
3	6"	WASTE DRAINS (GMA)	E 4775'-6"	N 9314'-8 13/16"	EL. 19'-6"
4	6"	HRSG DRAINS (LCL)	E 4775'-6"	N 9317'-2 13/16"	EL. 19'-6"
5	1"	AMMONIA UNIT 10 (HST)	E 5136'-0 11/16"	N 10261'-2 9/16"	EL. 21'-0"
6	1"	AMMONIA UNIT 20 (HST)	E 5214'-7 3/16	N 9886'-0 1/8"	EL. 21'-0"

50 0 50 100 150
SCALE: 1"=50'-0"

CBO-U- 101
UNITS: COMMON
ISSUED FOR CONSTRUCTION
PENDING CBO APPROVAL

Figure 2. SITE LAYOUT PLAN

WorleyParsons resources & energy

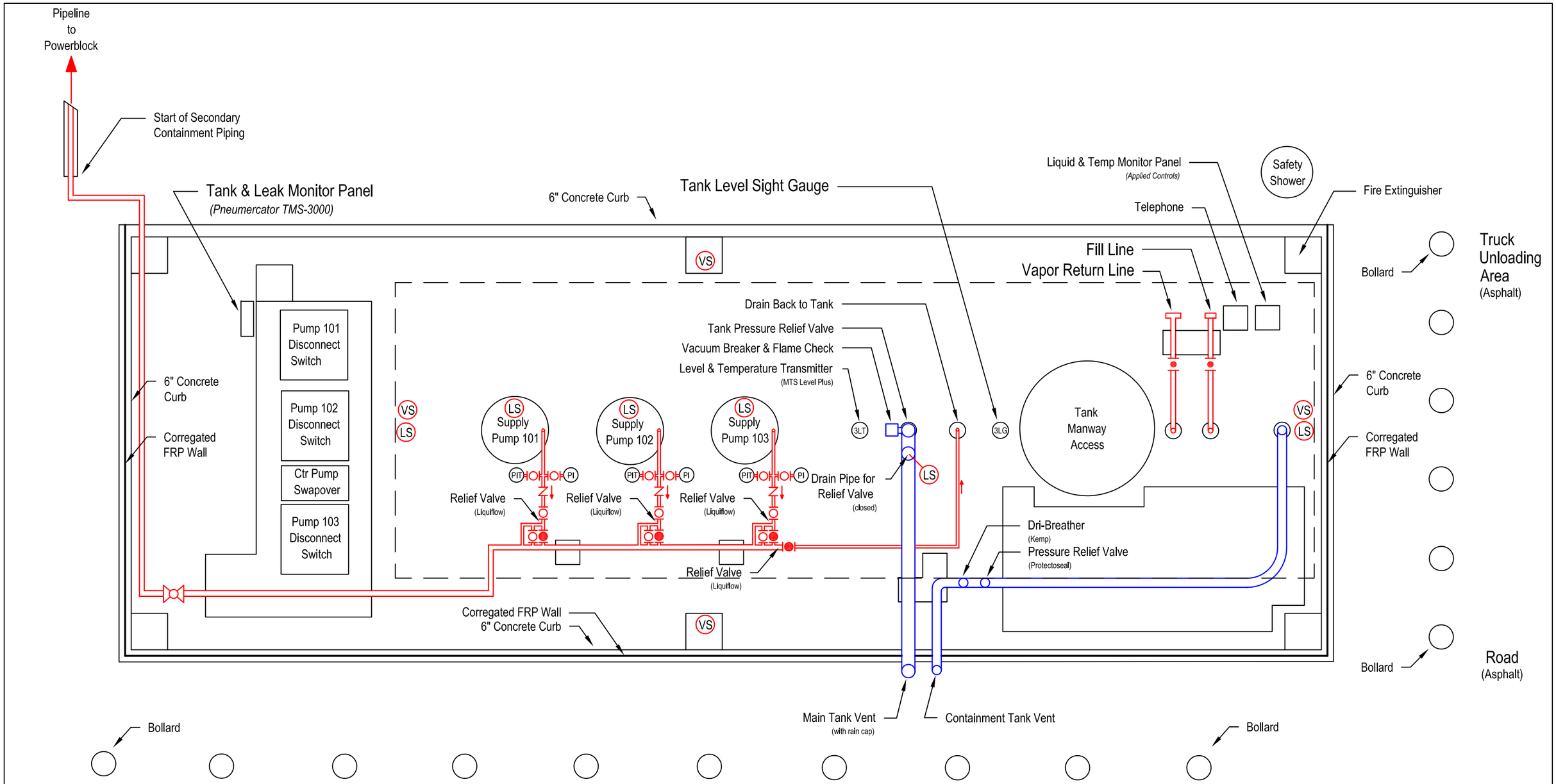
El Segundo Energy Center

GENERAL ARRANGEMENT PLAN OVERALL SITE PLAN

SIEMENS Energy, Inc.

USA659-UC07-00U-100201

USA659 | UC07 | 00U | 100201 | 4 | 1 / 2



NOTES:

1. Top view of aqueous ammonia underground storage tank: 20,000 gallon, carbon steel tank contained in a FRP-clad containment tank below a concrete secondary containment pad and corregated FRP siding (except north side) and roof.
2. For specific tank details, see Drawing 5235705-1, SCR Aqueous Ammonia Storage Facility Piping Plan & Sections. Electrical conduit and controls not shown.
3. Pnumercator Tank Monitor Panel monitors leak sensors with local alarm + wired to the Applied Controls Monitor Panel which transmits alarm signal to Control Room. Liquid leak alarms interconnected to shut-down supply pumps.

(LS) Liquid leak sensor - tank annular space at each end of tank, pump sumps, tank vent pressure relief.

(VS) Vapor leak sensor - approximately 8 feet over the concrete floor above each end of the tank and adjacent to the north and south side of the tank middle.

Scale: 1/4" = 1'
(based on field measurements)

El Segundo Power LLC

AQUEOUS AMMONIA UNDERGROUND TANK
(Top View)

301 Vista Del Mar Boulevard
El Segundo, California 90245

Proj. No.:	URS 29880137	Date:	9/2011
Project:	RMP Update	Figure:	3

APPENDICES

APPENDIX A: LIST OF INCORPORATED SELECT REFERENCES

The following table identifies a select list of drawings that are incorporated by reference into this RMP that, along with additional references, are available at the site. Note that new documents for the ESEC Modifications are under development as of this RMP update.

APPENDIX A: LIST OF REFERENCES INCORPORATED INTO THE RMP			
No.	**Title / Description**	**Purpose**	**Revision Date**
Station Descriptions, Operation and Maintenance Manuals & Drawings			
USA659-XS00-00HSJ-310016	Ammonia System Description	Summary of design criteria, system and equipment, and safety for Units 5 & 7 Pipeline and SCR System	June 2012
TWAL-0201-SP05	System Description	SCR system description, process, skid, vaporizer, gas fans, injection grid, catalyst & DCS controls	11/24/2011
-	Balance of Plant Familiarization Training Manual, Siemens	Familiarization of Units 5 & 7 SCR System safety, startup, normal, and emergency operation.	4/2012
USA659-XW01-00U-310001	Piping Fabrication & Installation Technical Specification	Design requirements, material requirements, fabrication, installation, inspection & test requirements for piping, Units 5 & 7	9/2011
USA659-XW01-00U-300052	Piping Line Specification	U/G piping: Perma-Pipe material requirements, specifications, and installation requirements, Units 5 & 7	11/17/2011
USA659-XW01-00U-300057	Piping Line Specification	A/G piping: Perma-Pipe material requirements, specifications, and installation requirements, Units 5 & 7	7/24/2012
-	Aqueous Ammonia Evaporation & Control System Operation and Maintenance Manual, Unit 4, DNX Engineers.	Process description, initial startup and optimization procedures, maintenance procedures, equipment and instrumentation list, ammonia safety information, SCR Skid drawings.	4/09/2007
-	El Segundo Steam Station, Units 3 &4, System Description R	Chemical Feed Station Description.	_
-	Instruction Book for Care & Operation of SCR Systems, SCE Units 3 & 4, Babcock & Wilcox (4 Volumes)	Overview, specifications, performance, process and equipment descriptions, listing of drawings, operation (pre-startup, normal and auto startup and shutdown, emergency shutdown), troubleshooting, maintenance program, set points, instrument list, and equipment manufacturer manuals and drawings.	7/1994
-	Operating Instruction Manual for SCR System, Unit 3	Overview, specifications, performance, process and equipment descriptions, listing of drawings, operation (pre-startup, normal startup and shutdown, emergency shutdown), troubleshooting, maintenance, set points, instrument list, manuals and drawings.	3/2001
-	System Operating Procedure, Combustion Air and Flue Gas System, Units 3 &4	Operator OMT training procedure includes the aqueous ammonia system and SCR description, flows, controls and indications, alarms, precautions, safety and environmental concerns, startup, normal, etc.	1/19/2004
-	SCR System Training Program For ESGS Units 3 &4, Babcock & Wilcox	Describes operating theory, design conditions, process flows, aqua ammonia system and controls, SCR controls, operation (startup, shutdown, emergency shutdown, etc.), maintenance, troubleshooting, design features and safety information.	1/31/1994

APPENDIX A: LIST OF REFERENCES INCORPORATED INTO THE RMP			
No.	**Title / Description**	**Purpose**	**Revision Date**
		Station Plans	
7-1	Emergency Preparedness & Emergency Response Plan	Capabilities and training, lines of authority and personnel roles, evacuation plan, list of emergency equipment, levels of response and external assistance, containment and removal of hazmat, etc.	July 2011
-	Hazardous Material Business Plan (Unified Program)	UP Program forms for CalARP Program Registration, UP Hazardous Materials Inventory, UST monitoring and release plan, Consolidated Contingency Plan.	3/2011 & 6/2011
		Station Orders	
EL A-122	Chemical/Oil Transfers & Deliveries	Operator requirements to receive and oversee deliveries to prevent concerns and respond to spills.	9/2011
EL A-123	Aqueous Ammonia UST Plan & SCR Delivery System	Monitoring, alarms and spill response procedure for operators.	10/2011
EL O-103	Locking of Critical Valves	Identifies valves that must be locked in the normal operating position to prevent unauthorized access and the possibility of a release.	8/2009
		Station Procedures & Forms	
A-17 (vendor)	Airgas Aqua Trailer Deliveries Operating Procedure	Requires minimum driver training (ammonia safety, first aid, HAZWOPER), procedures to stabilize truck, driver to be within reach of truck emergency shut-off during entire delivery, must wear PPE, etc.	11/04/2010
EL A-123	Ammonia UST Plan & SCR Ammonia Delivery System	Safe operation of the UST and delivery system, including ammonia deliveries, monitoring and leak detection, reporting, maintenance, etc.	10/2011
EL A-123	Ammonia UST Plan and Delivery System Procedure	Operator requirements for inspecting and monitoring the tank, maintenance schedule, spill and release procedure, etc.	10/2011
OSH-1501	Change Analysis (Corporate Safety Manual)	Requires planning for ensuring changes (other than replacement in kind) are assessed and communicated for effects on safety, equipment and system reliability.	10/06/2009
_	Construction & Major Modification Review	Requires that use of standard forms in the review of new construction or major modification to determine effects on safety, equipment and system reliability.	9/05/2001
-	Daily Environmental Inspection Report	Daily inspection checklist that must be completed by operators after observing the aqua ammonia tank, alarms, piping, SCR units, etc.	7/2011
-	Emergency Contacts List	Listing of circumstances that require notification (e.g., aqua ammonia release), who to contact, when and the regulatory citation.	6/2011
-	RMP Management of Change Form	Form to be completed, reviewed and approved prior to any proposed changes (except for replacement in kind) to the NH4OH concentration or the process technology, equipment, and related procedures.	10/01/2011
EL A-118	Safe Handling of Hazardous Materials	MSDS use, training, labeling, spill reporting, etc.	
EL A1-4	SCR Ammonia Pump Replacement Procedure	Safe removal and installation of feed pump, including required tools, equipment, PPE, procedure, release response, etc.	8/2004
EL 1-3	SCR Maintenance Procedure	Cleaning the SCR skid vaporizer circuit, spray nozzles, and ammonia filters replacement.	9/14/2011
_	Site Safety Manual	Policies on Contractor Safety, Change Analysis, Emergency Response, Hot Work, Lock Out – Tag Out, Preventative Maintenance, etc.	2011 (varies by policy)

APPENDIX A: LIST OF REFERENCES INCORPORATED INTO THE RMP			
No.	**Title / Description**	**Purpose**	**Revision Date**
		Select Drawings	
USA659-UG00-10U-101601	General Arrangement Plan – Site Plan	Site plan showing features of ESGS.	2/09/2012
USA659-XG02-HSJ00-4181-1	Ammonia Storage & Transfer P&ID	Piping P&ID from UST to Units 5 & 7	2/20/2012
USA659-XJ00-HSJ30-530001	A/G Ammonia Supply Header Piping Isometric	Isometric showing piping supports (21 Sheets)	8/02/2012
USA659-XJ00-10HSJ30-530001	Underground Piping Isometric, Ammonia System	Ammonia U/G piping isometric, Unit 5 (power block 10)	11/30/2011
USA659-XJ00-20HSJ30-530001	Underground Piping Isometric, Ammonia System	Ammonia U/G piping isometric, Unit 7 (power block 20)	11/30/2011
D5040-12-69-BO	Perma-Pipe El Segundo Energy Ammonia (9 sheets)	U/G piping specifications and design, Units 5 & 7	2/29/2012
D-FC0166-M01	Ammonia Dosing System P&ID	P&ID of the Ammonia Dosing Skid	12/14/12
D-FC0166-M011	Ammonia Dosing Chemical Feed System Mechanical Layout	Layout of the Ammonia Dosing Skid	4/23/2011
D-FC0166-M21A	Chemical Dosing Building Equipment Layout	Layout of the Chemical Dosing Building	4/15/2011
D-FC0166-M21B	Chemical Dosing Building Equipment Layout	Layout of the Chemical Dosing Building	4/15/2011
D-FC0166-M21C	Chemical Dosing Building Equipment Layout	Layout of the Chemical Dosing Building	4/15/2011
21011-577-04-131-001	Arrangement Ammonia Flow Control Skid	General arrangement of the SCR Skid, Units 5 & 7	2/06/2011
21019-105-9	P&ID HRSG SCR DeNOx System	P&ID of the SCR System, Units 5 & 7	8/03/2011
D5040-12-68-BO	El Segundo Energy Ammonia	NH_4OH underground piping details, Units 5 & 7	2/29/2012
-	JOOR 20,000 Gallon Tank Closure Details, SCE	Tank opening closure details	1/19/1993
-	JOOR 20,000 Gallon Tank General Arrangement, SCE	Tank dimensions, openings, specifications and features	1/19/1993
-	JOOR 20,000 Gallon Tank Nozzle Containment Details, SCE	Tank opening and nozzle details	1/19/1993
468247-3	Schematic of Ammonia Storage Area (Tank Area)	P & ID of the tank and delivery system	3/21/2006
5218571-1	Schematic of Chemical Feed System	P & ID of the chemical feed station in Unit 3.	3/21/2006
5238449A-2	Schematic of Unit 3 Vaporization Skid	P & ID of the Unit 3 Vaporization Skid.	3/21/2006
5238449-2	Schematic of Unit 4 Vaporization Skid	P & ID of the Unit 4 Vaporization Skid.	3/21/2006
5235705-1	SCR Aqueous Ammonia Storage Facility Piping Plan & Sections	Layout of the tank area from the top showing the piping details, concrete containment curb, etc.	9/30/1993
5237796-1	SCR Aqueous Ammonia Storage Facility Plan Sec's & Det's	Tanks foundation plan and anchor plan details.	8/18/1993

APPENDIX B

MATERIAL SAFETY DATA SHEETS FOR AMMONIUM HYDROXIDE:

5–19.9% AMMONIA

20-30% AMMONIA

SECTION 1: CHEMICAL PRODUCT & COMPANY IDENTIFICATION

CHEMICAL NAME: Ammonium Hydroxide **TRADE NAMES / SYNONYMS:** Aqua Ammonia, Ammonium Hydroxide

MANUFACTURER AND/OR DISTRIBUTOR:
Airgas Specialty Products
2530 Sever Road, 300
Lawrenceville, GA 30043 USA

EMERGENCY TELEPHONE NUMBERS:
Transportation (CHEMTREC): 1-800-424-9300
Environmental/Health/Safety (24-hr): 1-800-528-4963
Customer Service (Toll Free): 1-800-295-2225

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

CHEMICAL	FORMULA	% BY WEIGHT	CAS	OSHA PEL	NIOSH REL / ACGIH TLV		IDLH
				25 ppm (California only)			
Ammonia	NH_3	5-19.9	7664-41-7	50 ppm (TWA)	25 ppm (TWA)	35 ppm (STEL)	300ppm
Water	H_2O	80.1-95	7732-18-5	None	None	None	
Aqua Ammonia	NH_4OH	100	1336-21-6	------	------	------	

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: 1. Colorless liquid with a pungent odor. **2.** Avoid contact with liquid and vapor. **3**. Not flammable. **4**. Mixes with water. **5**. Harmful to aquatic life in very low concentrations. **6.** Stop discharge if possible.

POTENTIAL HEALTH EFFECT

ROUTES OF ENTRY: Inhalation, Skin Contact, Eye Contact, Ingestion **TARGET ORGANS:** Eyes, skin and respiratory system. **EYE CONTACT:** May be severely irritating upon liquid exposure, with irritation from fumes. **SKIN CONTACT:** High concentrations can cause severe irritation and burns. **INHALATION:** The gas can be suffocating and is irritating to the mucous membranes and lung tissue. **INGESTION:** Can cause vomiting, nausea and corrosive burns to the esophagus and stomach. The exact nature and intensity of toxic effects following ingestion of varying amounts of strong aqua ammonia solution (ex. 28%) is unpredictable. The most accepted view is that any amount from one teaspoon or greater can be dangerous if ingested.

SECTION 4: FIRST AID MEASURES

EYE CONTACT: Flush with large amounts of water for at least 15 minutes then immediately seek medical aid.
SKIN CONTACT: Immediately flush with large quantities of water for at least 15 minutes while removing clothing. Seek immediate medical aid.
INHALATION: Remove from exposure. If breathing has stopped or is difficult, administer artificial respiration or oxygen as needed. Seek immediate medical aid.
INGESTION: Do not induce vomiting. Have victim drink large quantities of water if conscious. Immediately seek medical aid. Never give anything by mouth to an unconscious person**.**

SECTION 5: FIRE FIGHTING MEASURES

FLASH POINT(method used): Not Applicable **FLAMMABLE LIMITS:** 16-25% NH_3 in air (for labeling purposes, not DOT flammable gas). **EXTINGUISHING MEDIA:** Water fog or spray for escaping ammonia gas.
SPECIAL FIRE FIGHTING PROCEDURES: The mixture will not burn but escaping gas can burn in the range of 16-25% NH_3 in air. Wear full protective clothing and self-contained breathing apparatus in the pressure demand mode.
NFPA HAZARD CLASSIFICATION (Aqua): Health: 2 **Flammability:** 1 **Reactivity:** 0 (least-0 —— 4-highest)

SECTION 6: ACCIDENTAL RELEASE MEASURES

In US, federal regulations require that a release of 1,000 lb. or more of ammonium hydroxide must be reported immediately to the National Response Center at (800) 424-8802, the SERC and the LEPC. In California, ALL releases must be reported to CUPA, state and local agencies. Additional state and local regulations may apply. **SUGGESTED LOCAL ACTION:** Releases will liberate irritating vapors. Spilled liquids should be contained and not washed into sewers or ground water. Prevent large quantities from contact with vegetation or waterways. Ammonium hydroxide is a regulated material and reporting of any release may be required. Any release of this material during the course of loading, transporting, unloading or temporary storage must be reported to the U.S. DOT as required by 49 CFR 171.15 and 171.16.

SECTION 7: HANDLING AND STORAGE

Store in ventilated containers or pressure vessels away from heat. Open containers cautiously in case of pressure build up. Zinc, copper and copper alloys such as brass are rapidly corroded by ammonium hydroxide.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

RESPIRATORY PROTECTION: Respiratory protection approved by NIOSH / MSHA for ammonia must be used when exposure limits are exceeded. Whether chemical canister respirator or self-contained breathing apparatus is sufficient for effective respiratory protection depends on the type and magnitude of exposure.
SKIN PROTECTION: Rubber gloves and rubber or other types of approved protective clothing should be used to prevent skin contact. A face shield should be used for increased protection from contact with liquid or vapor.
EYE PROTECTION: Chemical splash goggles, approved for use with ammonia, must be worn to prevent eye contact with liquid or vapor. A face shield should be used for increased protection from contact with liquid.
VENTILATION: Local positive pressure and/or exhaust ventilation should be used to reduce vapor concentrations in confined spaces. Ammonia vapor, being lighter than air, can be expected to dissipate to the upper atmosphere. Ammonia concentrations may also be reduced by the use of an appropriate absorbent or reactant material.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT: 160°F (10% Sol'n.)
SOLUBILITY IN WATER: Complete
MELTING POINT: Approx 15°F (10% Sol'n.)
PERCENT VOLATILE BY VOLUME: 100%
VAPOR PRESSURE: 130 mm Hg @ 80°F(10% Sol'n.)
SPECIFIC GRAVITY: 0.928 @ 60°F (19.5% Sol'n., water=1)
VAPOR DENSITY: 0.60 @ 32°F (Air=1)
pH: Approx. 11.6 for 1 N Sol'n. in water
APPEARANCE: Colorless, pungent liquid

SECTION 10: STABILITY AND REACTIVITY

STABILITY: Material generally considered stable. Heating above ambient temperature causes the vapor pressure of ammonia to increase rapidly.

INCOMPATIBILITY (materials to avoid): Strong acids. Aqua ammonia reacts with bromine, chlorine, mercury, silver, silver solder, and hypochlorite (bleach) to form explosive compounds. Avoid use of metals containing copper or zinc.

HAZARDOUS DECOMPOSITION PRODUCTS: Heating and contact of vapors with very hot surfaces may form hydrogen. The decomposition temperature may be lowered to 575°F by contact with certain metals such as nickel.

HAZARDOUS POLYMERIZATION: Will not occur
CONDITIONS TO AVOID: Not applicable

SECTION 11: TOXICOLOGICAL INFORMATION

TOXICITY BY INGESTION: Grade 3; Oral Rat, LD_{50} = 350 mg/kg. Ammonia is a strong alkali and readily damages all body tissues. Ammonia is not a cumulative metabolic poison.

SECTION 12: ECOLOGICAL INFORMATION

AQUATIC TOXICITY: 6.25 ppm 24hr/Trout/Lethal/Freshwater; 15ppm 48hr/Sunfish/TLm/Tap Water
WATERFOWL TOXICITY: Data not available
BIOCHEMICAL OXYGEN DEMAND: Data not available
FOOD CHAIN CONCENTRATION POTENTIAL: None

SECTION 13: DISPOSAL CONSIDERATIONS

Consult local, state or federal regulatory agencies for acceptable disposal procedures and disposal locations. Disposal in streams or sewers is generally contrary to federal, state, and local regulations. For Hazardous Waste Regulations call (800) 424-9346, the RCRA Hotline.

SECTION 14: TRANSPORT INFORMATION

	5-10% Ammonia Solutions	>10-19.9% Ammonia Solutions
Proper shipping name:	Corrosive Liquid, N.O.S. (contains ammonia)	Ammonium Hydroxide
DOT Hazard Class:	8	8
Identification Number:	UN1760	UN2672
Packing Group:	III	III

SECTION 15: REGULATORY INFORMATION

NOTICE: This product is subject to the reporting requirements of SARA (1986, Section 313 of Title III) and 40 CFR Part 370.

CERCLA/SUPERFUND, 40 CFR 117.302: Unpermitted releases of 1,000 lb. or more of ammonium hydroxide in any 24-hour period must be reported immediately to the NRC at 1-800-424-8802, the SERC, and the LEPC. Written follow-up is required to SERC & LEPC.

OSHA HAZARD COMMUNICATION RULE, 20 CFR 1910.1200: Aqua ammonia is a hazardous chemical.

TOXIC SUBSTANCE CONTROL ACT: This material is listed in the TSCA Inventory.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (SARA, TITLE III): Section 302 Extremely Hazardous Substance: Yes; Section 311/312 Hazardous Categories: Immediate (Acute) Health Hazards; Section 313 Toxic Chemical: Yes (as ammonia); **WHMIS:** One percent (1%) as ammonia. **CALIFORNIA PROPOSITION 65:** Reproductive: No Carcinogen: No

OSHA PROCESS SAFETY MANAGEMENT, 29 CFR 1910.119: This product is NOT subject to the Process Safety Management requirements of 29 CFR 1910.119.

EPA CHEMICAL ACCIDENTAL RELEASE PREVENTION, 40 CFR PART 68: This product is NOT subject to the Risk Management Plan requirements of 40 CFR Part 68. **DRINKING WATER:** Maximum use dosage in potable water is 10mg/l.

SECTION 16: OTHER INFORMATION

REASON FOR REVISION: 1. Addition of new Toll Free Customer Service Number in Section 1. 2. Revision to concentration range in section 2. 3. Revision to proper DOT Shipping Name. 4. Revision to EPCRA Section 302 information in Section 15; 6. Revised LEL and UEL. 7. Company Name Change. 8. Revised LEL and UEL. 9. Company Address Changed.

MSDS PREPARED BY: Airgas Specialty Products

SECTION 1: CHEMICAL PRODUCT & COMPANY IDENTIFICATION

CHEMICAL NAME: Ammonium Hydroxide **TRADE NAMES / SYNONYMS:** Aqua Ammonia, Ammonium Hydroxide

MANUFACTURER AND/OR DISTRIBUTOR:
Airgas Specialty Products
2530 Sever Road, 300
Lawrenceville, GA 30043 USA

EMERGENCY TELEPHONE NUMBERS:
Transportation (CHEMTREC): 1-800-424-9300
Environmental/Health/Safety (24-hr): 1-800-528-4963
Customer Service (Toll Free): 1-800-295-2225

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

CHEMICAL	FORMULA	% BY WEIGHT	CAS	OSHA PEL	NIOSH REL / ACGIH TLV		IDLH
				25 ppm (California only)			
Ammonia	NH_3	20-30	7664-41-7	50 ppm (TWA)	25 ppm (TWA)	35 ppm (STEL)	300ppm
Water	H_2O	70-80	7732-18-5	None	None	None	
Aqua Ammonia	NH_4OH	100	1336-21-6	------	------	------	

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: 1. Colorless liquid with a pungent odor. **2.** Avoid contact with liquid and vapor. **3**. Not flammable. **4**. Mixes with water. **5**. Harmful to aquatic life in very low concentrations. **6.** Stop discharge if possible.

POTENTIAL HEALTH EFFECT

ROUTES OF ENTRY: Inhalation, Skin Contact, Eye Contact, Ingestion **TARGET ORGANS:** Eyes, skin and respiratory system. **EYE CONTACT:** May be severely irritating upon liquid exposure, with irritation from fumes. **SKIN CONTACT:** High concentrations can cause severe irritation and burns. **INHALATION:** The gas can be suffocating and is irritating to the mucous membranes and lung tissue. **INGESTION:** Can cause vomiting, nausea and corrosive burns to the esophagus and stomach. The exact nature and intensity of toxic effects following ingestion of varying amounts of strong aqua ammonia solution (ex. 20-30%) is unpredictable. The most accepted view is that any amount from one teaspoon or greater can be dangerous if ingested.

SECTION 4: FIRST AID MEASURES

EYE CONTACT: Flush with large amounts of water for at least 15 minutes then immediately seek medical aid.
SKIN CONTACT: Immediately flush with large quantities of water for at least 15 minutes while removing clothing. Seek immediate medical aid.
INHALATION: Remove from exposure. If breathing has stopped or is difficult, administer artificial respiration or oxygen as needed. Seek immediate medical aid.
INGESTION: Do not induce vomiting. Have victim drink large quantities of water if conscious. Immediately seek medical aid. Never give anything by mouth to an unconscious person**.**

SECTION 5: FIRE FIGHTING MEASURES

FLASH POINT(method used): Not Applicable **FLAMMABLE LIMITS:** 16-25% NH_3 in air (for labeling purposes, not DOT flammable gas). **EXTINGUISHING MEDIA:** Water fog or spray for escaping ammonia gas.
SPECIAL FIRE FIGHTING PROCEDURES: The mixture will not burn but escaping gas can burn in the range of 16-25% NH_3 in air. Wear full protective clothing and self-contained breathing apparatus in the pressure demand mode.
NFPA HAZARD CLASSIFICATION (Aqua): Health: 2 **Flammability:** 1 **Reactivity:** 0 (least-0 —— 4-highest)

SECTION 6: ACCIDENTAL RELEASE MEASURES

In US, federal regulations require that a release of 1,000 lb. or more of ammonium hydroxide must be reported immediately to the National Response Center at (800) 424-8802, the SERC and the LEPC. In California, ALL releases must be reported to CUPA, state and local agencies. Additional state and local regulations may apply. **SUGGESTED LOCAL ACTION:** Releases will liberate irritating vapors. Spilled liquids should be contained and not washed into sewers or ground water. Prevent large quantities from contact with vegetation or waterways. Ammonium hydroxide is a regulated material and reporting of any release may be required. Any release of this material during the course of loading, transporting, unloading or temporary storage must be reported to the U.S. DOT as required by 49 CFR 171.15 and 171.16.

SECTION 7: HANDLING AND STORAGE

Store in ventilated containers or pressure vessels away from heat. Open containers cautiously in case of pressure build up. Zinc, copper and copper alloys such as brass are rapidly corroded by ammonium hydroxide.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

RESPIRATORY PROTECTION: Respiratory protection approved by NIOSH / MSHA for ammonia must be used when exposure limits are exceeded. Whether chemical canister respirator or self-contained breathing apparatus is sufficient for effective respiratory protection depends on the type and magnitude of exposure.
SKIN PROTECTION: Rubber gloves and rubber or other types of approved protective clothing should be used to prevent skin contact. A face shield should be used for increased protection from contact with liquid or vapor.
EYE PROTECTION: Chemical splash goggles, approved for use with ammonia, must be worn to prevent eye contact with liquid or vapor. A face shield should be used for increased protection from contact with liquid.
VENTILATION: Local positive pressure and/or exhaust ventilation should be used to reduce vapor concentrations in confined spaces. Ammonia vapor, being lighter than air, can be expected to dissipate to the upper atmosphere. Ammonia concentrations may also be reduced by the use of an appropriate absorbent or reactant material.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT: 83°F (30% Sol'n.)
SOLUBILITY IN WATER: Complete
MELTING POINT: Approx -98°F (30% Sol'n.)
PERCENT VOLATILE BY VOLUME: 100%
VAPOR PRESSURE: 720 mm Hg @ 80°F(30% Sol'n.)
SPECIFIC GRAVITY: 0.8974 @ 60°F (29.4% Sol'n., water=1)
VAPOR DENSITY: 0.60 @ 32°F (Air=1)
pH: Approx. 11.6 for 1 N Sol'n. in water
APPEARANCE: Colorless, pungent liquid

SECTION 10: STABILITY AND REACTIVITY

STABILITY: Material generally considered stable. Heating above ambient temperature the vapor pressure of ammonia to increase rapidly.

INCOMPATIBILITY (materials to avoid): Strong acids. Aqua ammonia reacts with bromine, chlorine, mercury, silver, silver solder, and hypochlorite (bleach) to form explosive compounds. Avoid use of metals containing copper or zinc.

HAZARDOUS DECOMPOSITION PRODUCTS: Heating and contact of vapors with very hot surfaces may form hydrogen. The decomposition temperature may be lowered to 575°F by contact with certain metals such as nickel.

HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID: Not applicable

SECTION 11: TOXICOLOGICAL INFORMATION

TOXICITY BY INGESTION: Grade 3; Oral Rat, LD_{50} = 350 mg/kg. Ammonia is a strong alkali and readily damages all body tissues. Ammonia is not a cumulative metabolic poison.

SECTION 12: ECOLOGICAL INFORMATION

AQUATIC TOXICITY: 6.25 ppm 24hr/Trout/Lethal/Freshwater; 15ppm 48hr/Sunfish/TLm/Tap Water

WATERFOWL TOXICITY: Data not available

BIOCHEMICAL OXYGEN DEMAND: Data not available

FOOD CHAIN CONCENTRATION POTENTIAL: None

SECTION 13: DISPOSAL CONSIDERATIONS

Consult local, state or federal regulatory agencies for acceptable disposal procedures and disposal locations. Disposal in streams or sewers is generally contrary to federal, state, and local regulations. For Hazardous Waste Regulations call (800) 424-9346, the RCRA Hotline.

SECTION 14: TRANSPORT INFORMATION

Proper shipping name: Ammonium Hydroxide
DOT Hazard Class: 8
Identification Number: UN2672
Packing Group: III

SECTION 15: REGULATORY INFORMATION

NOTICE: This product is subject to the reporting requirements of SARA (1986, Section 313 of Title III) and 40 CFR Part 370.

CERCLA/SUPERFUND, 40 CFR 117.302: Unpermitted releases of 1,000 lb. or more of ammonium hydroxide in any 24-hour period must be reported immediately to the NRC at 1-800-424-8802, the SERC, and the LEPC. Written follow-up is required to SERC & LEPC.

OSHA HAZARD COMMUNICATION RULE, 20 CFR 1910.1200: Aqua ammonia is a hazardous chemical.

TOXIC SUBSTANCE CONTROL ACT: This material is listed in the TSCA Inventory.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (SARA, TITLE III): Section 302 Extremely Hazardous Substance: Yes; Section 311/312 Hazardous Categories: Immediate (Acute) Health Hazards; Section 313 Toxic Chemical: Yes (as ammonia); **WHMIS:** One percent (1%) as ammonia. **CALIFORNIA PROPOSITION 65:** Reproductive: No Carcinogen: No

OSHA PROCESS SAFETY MANAGEMENT, 29 CFR 1910.119: This product is subject to the Process Safety Management requirements of 29 CFR 1910.119 if maintained on-site in concentrations above than 44% in quantities of 15,000 lb. or greater.

EPA CHEMICAL ACCIDENTAL RELEASE PREVENTION, 40 CFR PART 68: If maintained on-site quantities of contained ammonia are greater than 20,000 lbs, this product is subject to Risk Management Plan requirements of 40 CFR Part 68. Maintained on-site quantities of contained ammonia less than 20,000 lbs. are NOT subject to RMP requirements of 40 CFR Part 68.

DRINKING WATER: Maximum use dosage in potable water is 10mg/l.

SECTION 16: OTHER INFORMATION

REASON FOR REVISION: 1. Addition of new Toll Free Customer Service Number in Section 1. 2. Revision to concentration range in section 2. 3. Revision to proper DOT Shipping Name. 4. Revision to EPCRA Section 302 information in Section 15; 6. Revised LEL and UEL. 7. Company Name Change. 8. Revised LEL and UEL. 9. Company Address Changed.

MSDS PREPARED BY: Airgas Specialty Products

APPENDIX C

P&ID

SCR AQUEOUS AMMONIA STORAGE FACILITY (UST), DRAWING 468247-3

SCHEMATIC SCR SYSTEM VAPORIZATION SKID, UNIT 3, DRAWING 5238449A-2

SCHEMATIC SCR SYSTEM VAPORIZATION SKID, UNIT 4, DRAWING 5238449-2

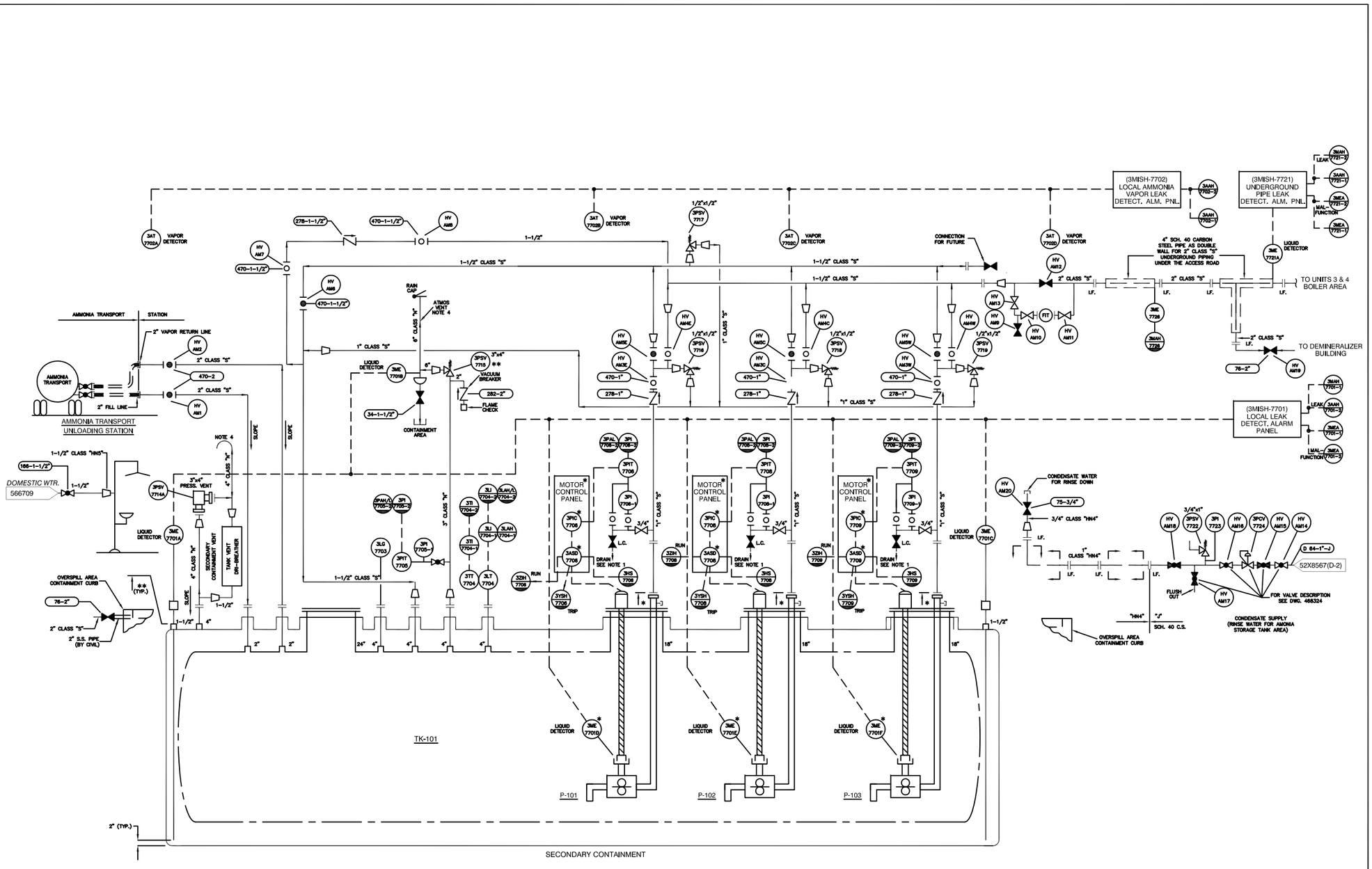
CHEMICAL FEED STATION (UNIT 3), DRAWING 5218571-1

AMMONIA STORAGE & TRANSFER (UNITS 5 & 7 PIPELINE) P&ID, USA659-XG02-HSJ00-4181-1

P&ID HRSG DENOX SYSTEM, UNITS 5 & 7 (SCR SKIDS), DRAWING 21019-105-09

AMMONIA DOSING SYSTEM P&ID, UNITS 5 & 7, DRAWING D-FC0166-M01

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
JV/105 4/5/05			1009724002-E2



TK-101
AQUEOUS AMMONIA TANK
20,000 GAL. CAPACITY
50 PSIG ASME

P-101
EAST HP AQUEOUS AMMONIA SUPPLY PUMP
MAG. COUP. GEAR PUMP
0.068 GPM – 7 GPM
(SEE NOTE 2)

P-102
CENTER HP AQUEOUS AMMONIA SUPPLY PUMP
MAG. COUP. GEAR PUMP
0.068 GPM – 7 GPM
(SEE NOTE 2)

P-103
WEST HP AQUEOUS AMMONIA SUPPLY PUMP
MAG. COUP. GEAR PUMP
0.068 GPM – 7 GPM
(SEE NOTE 2)

NOTES:

1. DRAINS MUST BE ROUTED TO A SAFE LOCATION.
2. EACH PUMP IS A FULL CAPACITY PUMP TO HANDLE TWO UNITS OPERATION. TWO PUMPS ARE FOR STANDBY. A SEQUENCE OF OPERATION SHALL BE DEVELOPED TO EQUALLY TIMESHARE THE PUMP OPERATION.
3. ASD = ADJUSTABLE SPEED DRIVE.
4. RELIEF & VENT OPENINGS TO ATMOS. MUST BE 12'-0" MIN. ABOVE GRADE.
5. HIGH LEVEL ALARM SET POINT IS 90% TANK VOL.
6. AMMONIA SUPPLY PUMPS WILL AUTOMATICALLY SHUT OFF WHEN A LEAK IS DETECTED.
7. PROVIDE A TELEPHONE AT THIS LOADING AREA.
8. * = SUPPLIED BY PUMP SUPPLIER.
9. ** = SUPPLIED BY TANK SUPPLIER.
10. DRAWING WAS CREATED USING SCE ENGINEERD HARD COPY DRAWING NO. 468247-3 AS REFERENCE.
11. LC – LOCKED CLOSE

REV	DATE	BY	CHK'D	APP'VD	DESCRIPTION/ISSUE
3	1/21/06	SJZ	SS	SS	REDRAWN RECORD REVISION
2	7/8/96	DRD	RHH	MB	AS-BUILT
1					INST. UNIT DESIGNATION 4 WAS CHANGED TO 3
0	8/25/92	RHH	RHH	MB	ISSUED FOR CONSTRUCTION

Shaw Environmental, Inc.

EL SEGUNDO POWER LLC
301 VISTA DEL MAR
EL SEGUNDO, CA 90245

DRAWING NO. 468247-3
SCR AQUEOUS AMMONIA STORAGE FACILITY
P & I DIAGRAM
EL SEGUNDO GENERATING STATION UNITS 3&4
EL SEGUNDO, CALIFORNIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
J. VASQUEZ 4/5/05			1009724002-E5

FROM AQUEOUS NH_3 TERMINAL
5238449
A3-1

VAPORAIZATION SKID

TO NH_3/AIR VAPORIZER N
D4

TO NH_3/AIR VAPORIZER S
A4

FROM AQUEOUS NH_3 SUPPLY LINE N
D4

FROM AQUEOUS NH_3 SUPPLY LINE S
A4

5 VALVE MANIFOLD

DILUTION AIR FAN E

DILUTION AIR FAN W

NORTH SECONDARY AIR DUCTS

SOUTH SECONDARY AIR DUCTS

METALLIC HOSE P05

METALLIC HOSE P07

TO NORTH MANIFOLD FOR INJECTION GRIDS
5238450 (F5)

TO SOUTH MANIFOLD FOR INJECTION GRIDS
5238450 (F5)

AMMONIA VAPO LEAK DETECTOR

INSTRUMENT POWER SUPPLY

VENT TO ATMOSPHERE

REFERENCE DRAWINGS:	
468847	SCR AQUEOUS AMMONIA STORAGE FACILITY P&ID
5218571	CHEMICAL FEED SYSTEM UNITS 3&4 P&ID
5238449	SCHEMATIC SCR SYSTEM P&ID SHEET 3 VAPORIZATION SKID, UNIT 3 ONLY
5238447	SCHEMATIC SCR SYSTEM P&ID SHEET 2
5238466	SCHEMATIC SCR SYSTEM P&ID SHEET 1

REV	DATE	BY	CHK'D	APP'VD	DESCRIPTION/ISSUE
2	3/31/06	SJZ	SS	SS	REDRAWN REVISED FOR UNIT 3 ONLY
1	9/29/04	JS	DRB	DZ	AS-BUILT
0	9/25/02	JS	DRB	RLG	ISSUED FOR CONSTRUCTION

Shaw Environmental, Inc.

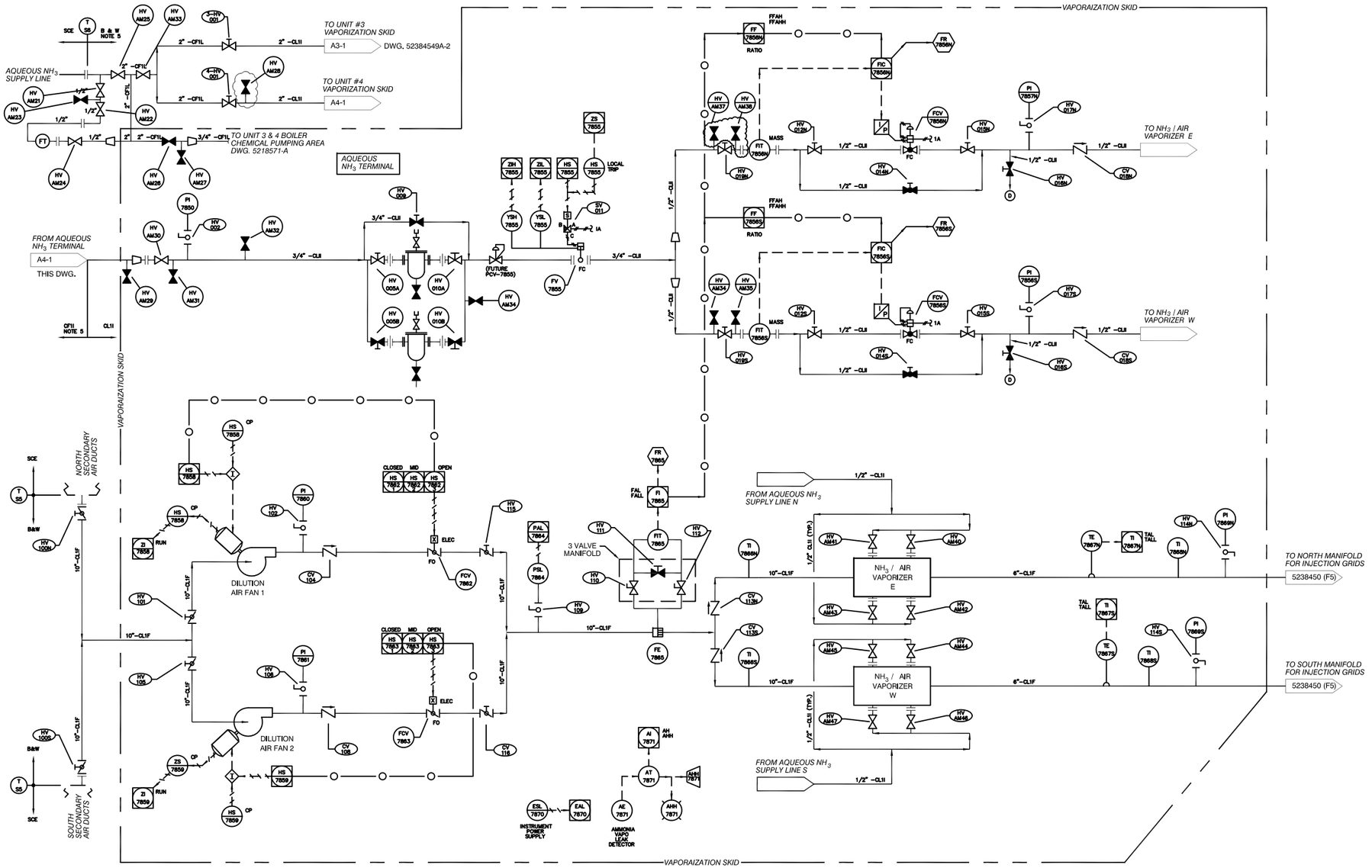
NRG

EL SEGUNDO POWER LLC
301 VISTA DEL MAR
EL SEGUNDO, CA 90245

DRAWING NO. 5238449A-2
SCHEMATIC SCR SYSTEM P&ID
VAPORIZATION SKID, UNIT 3

EL SEGUNDO GENERATING STATION
EL SEGUNDO, CALIFORNIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
JV/HDS			1009724002-E1
4/5/05			



REFERENCE DRAWINGS	
5238450	SCHEMATIC SCR SYSTEM P&ID SHEET 3
5238448	SCHEMATIC SCR SYSTEM P&ID SHEET 2
5238447	SCHEMATIC SCR SYSTEM P&ID SHEET 1

NOTES:
FOR P&ID DRAWING LIST, SYMBOLS AND NOTES NOMENCLATURE, SEE B&W DWG 437787E (SCE DWG 5238447).

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
2	3/21/06	SJZ	SS	SS	REDRAWN RECORD REVISION
1	6/30/04	JS	JFS	DZ	AS-BUILT

Shaw Environmental, Inc.

EL SEGUNDO POWER LLC
301 VISTA DEL MAR
EL SEGUNDO, CA 90245

DRAWING NO. 5238449-2

SCHEMATIC SCR SYSTEM P&ID SHEET 3
VAPORIZATION SKID, UNIT 4 ONLY

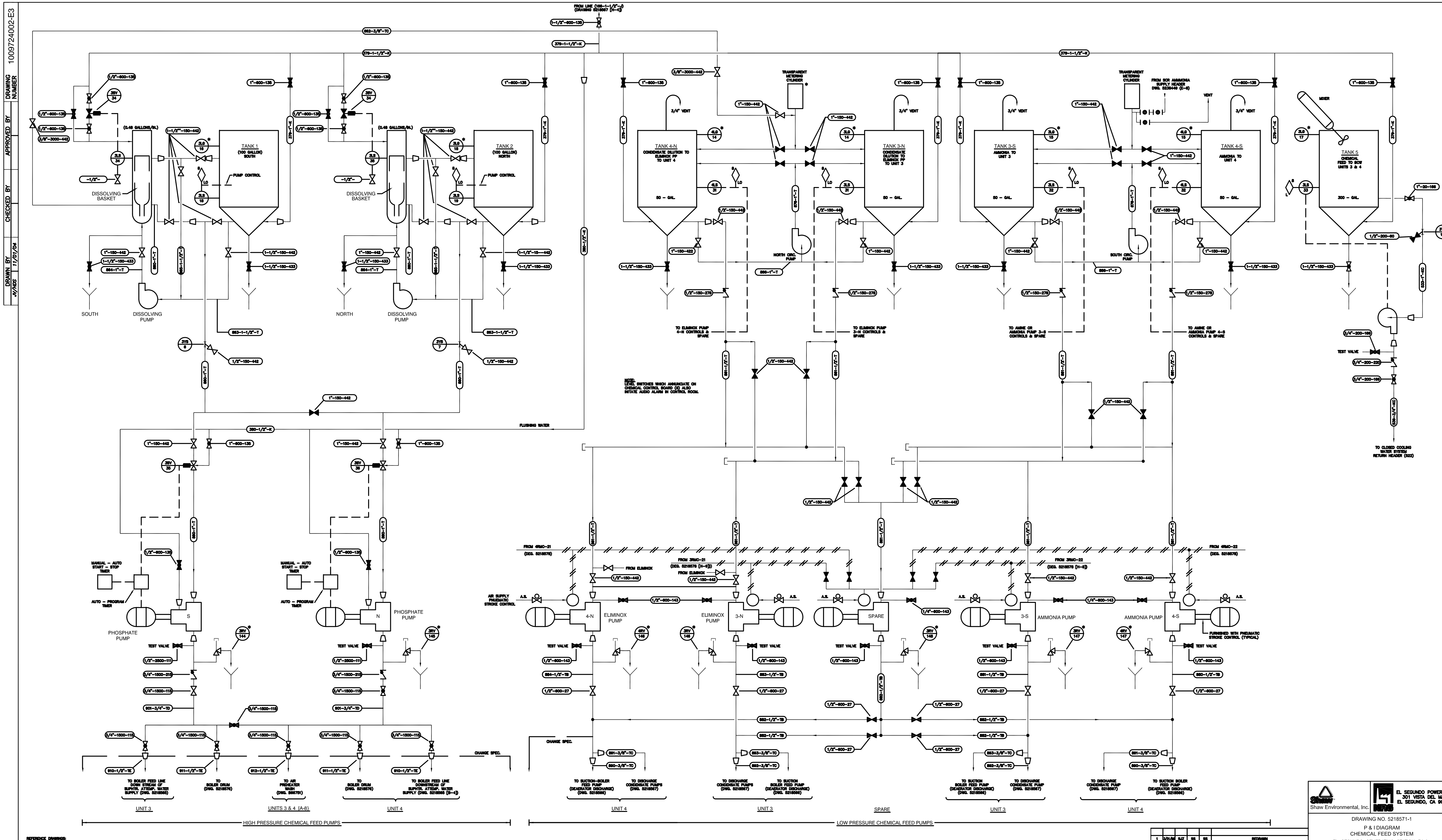
EL SEGUNDO GENERATING STATION
EL SEGUNDO, CALIFORNIA

DRAWING NUMBER 1009724002-E3

APPROVED BY

CHECKED BY

DRAWN BY JV/RDS 11/01/04



Shaw Environmental, Inc.

EL SEGUNDO POWER LLC
301 VISTA DEL MAR
EL SEGUNDO, CA 90245

DRAWING NO. 5218571-1

P & I DIAGRAM
CHEMICAL FEED SYSTEM

EL SEGUNDO GENERATING STATION 3&4
EL SEGUNDO, CALIFORNIA

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
1	3/21/06	SJZ	SS	SS	REDRAWN

A312 TP316L WITH A106 GR.B CONTAINMENT	150	41 C	106 F	10 bar	149 psi	b
A312 TP316L WITH FRP CONTAINMENT	150	41 C	106 F	10 bar	149 psi	a
Piping Material	ANSI-Class	Max. allowable Working Temp. MAWT	ALT Max. allowable Working Temp. ALT MAWT	Max. allowable Working Press. MAWP (gauge)	ALT Max. allowable Working Press. ALT MAWP (gauge)	Design Section
Werkstoff der Rohrleitung	ANSI-Klasse	Max. zulässige Betriebs-temperatur	ALT Max. zulässige Betriebs -temperatur	Max. zulässiger Betriebsdruck (Überdruck)	ALT Max. zulässiger Betriebsdruck (Überdruck)	Auslegungs-abschnitt

CBO-U-302
UNITS: 5, 6, 7, 8
ISSUED FOR CONSTRUCTION
PENDING CBO APPROVAL

Exportkennzeichnung AL:N ECCN:N
Die mit "AL ungleich N" gekennzeichneten Güter unterliegen bei der Ausfuhr aus der EU der europäischen bzw. deutschen Ausfuhrgenehmigungspflicht. Die mit "ECCN ungleich N" gekennzeichneten Güter unterliegen der US-Reexportgenehmigungspflicht. Auch ohne Kennzeichen, bzw. bei Kennzeichen "AL:N" oder "ECCN:N" kann sich eine Genehmigungspflicht, unter anderem durch den Endverbleib und Verwendungszweck der Güter, ergeben.

Export classification AL:N ECCN:N
Goods labeled with "AL not equal to N" are subject to European or German export authorization when being exported out of the EU. Goods labeled with "ECCN not equal to N" are subject to US reexport authorization. Even without a label, or with Label "AL:N" or "ECCN:N", authorization may be required due to the final, whereabouts and purpose for which the goods are to be used.

Index Rev.	Datum Date	bearb. Coord.		geprüft Checked		Änderungshinweise/Betreff of revision
e	2012-01-20	Cutbirth	D	Johnson	R	FINAL - ISSUED FOR CONSTRUCTION
d	2011-11-09	Cutbirth	D	Johnson	R	Fourth Release
c	2011-11-09	Cutbirth	D	Johnson	R	Second Release
b	2011-02-09	Cutbirth	D	Johnson	R	Second Release
a	2010-10-28	Cutbirth	D	Johnson	R	First Release

Projekt/Project: El Segundo Energy Center
PKZ/PC: USA659

	Datum Date	Name Name
gezeich. Drawn	2008-04-16	DAVIS
bearb. Coord.	2010-10-28	Cutbirth
geprüft Checked	2010-10-28	Johnson
Abtlg. Dept.	EE17	

Ursprung-Nr. Origin no.
Typ/IEC Type: XG02
Titel/Title: AMMONIA STORAGE & TRANSFER P&ID SYSTEM
Inhaltskennzeichen Content-code: 00HSJ00
Zeichn.-Nr. Serial no.

SIEMENS
Dienststr./Dept.: EE17
UNID: 476294361
Index/Rev.: e
Vers./Vers.:

Zeichnungs-Nr. Drawing no.: USA659-XG02-HSJ00-4181-1
Blatt-Nr. Sheet no.: 1/ 2

erstellt mit Created with: Smart Plant P&ID
Filtername Filter name:
Handhabung Handling: Public

A1

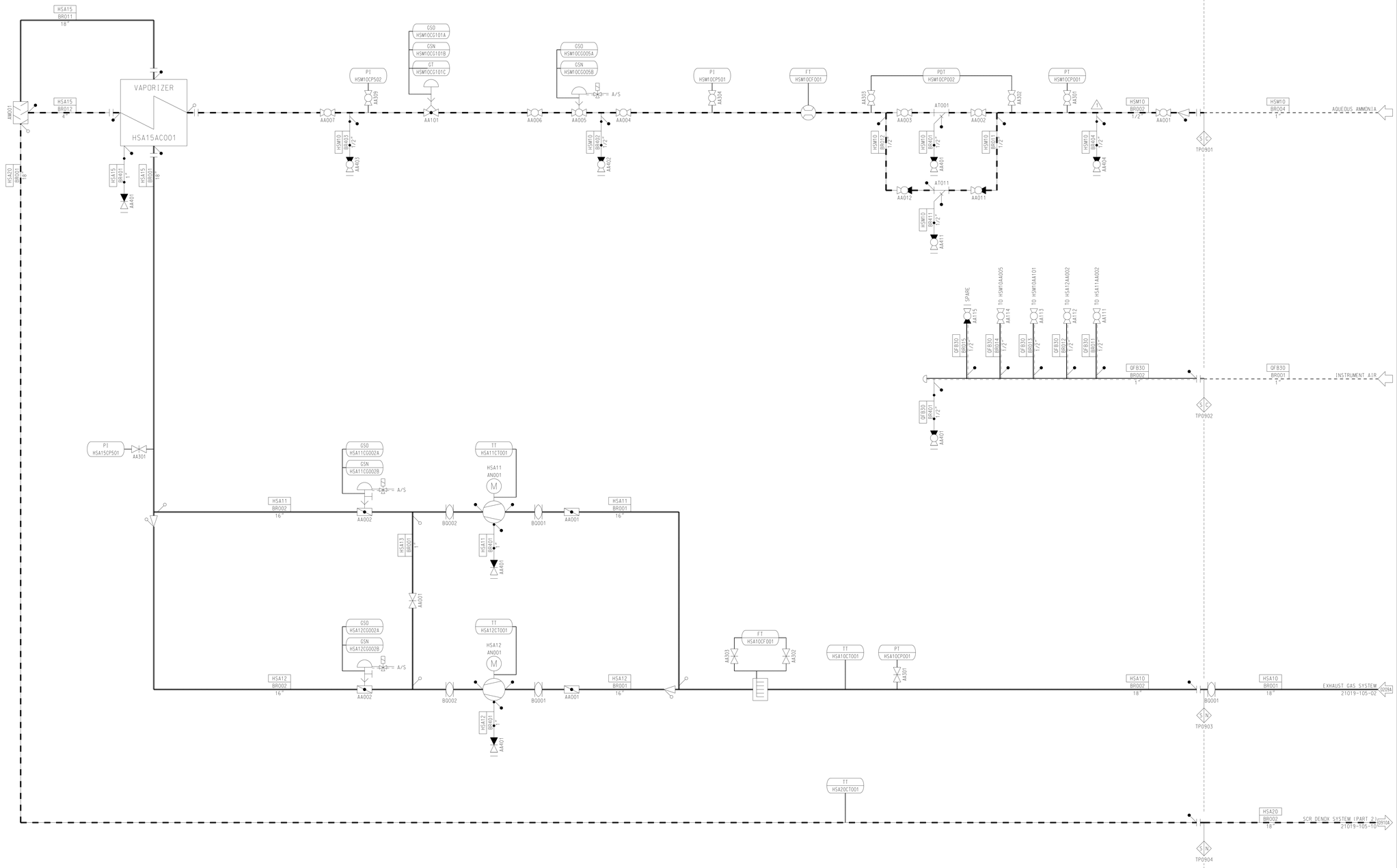
00UVM

CBO-U-302
UNITS: 5, 6, 7, 8
ISSUED FOR CONSTRUCTION
PENDING CBO APPROVAL

SIEMENS	PKZ/PC: USA659	DX/DCC Type: XG02	Inhaltskennzeichen Contents code: 00HSJ00	SNR: 476294361	Datum Date: 2012-01-20
Titel Title: AMMONIA STORAGE & TRANSFER SYSTEM P&ID				Abtlg. Dept: EE17	Blatt-Nr. Sheet no: 2 / 2
					Index Rev: e
erstellt mit Created with: Smart Plant P&ID	Zeichnungs-Nr. Drawing no: USA659-XG02-HSJ00-4181-1			Handhabung Handling: Public	

A1

AMMONIA SKID



GENERAL NOTES

- SCOPE OF SUPPLY INDICATION:
  - A. SYSTEMS: S = NEM SUB-SUPPLIER, N = NEM, C = CLIENT
  - B. COMPONENTS: S = NEM SUB-SUPPLIER, N = NEM, C = CLIENT
- ALL VENTS AT HIGH POINTS. ALL DRAINS AT LOW POINTS
- SECONDARY INSTRUMENT VALVE/MANIFOLDS OR INSTRUMENT BLOWDOWN VALVES ARE NOT INDICATED
- TSL = TO SAFE LOCATION
- CCC = CHEMICAL CLEANING CONNECTION
- PREFIX FOR ALL TAGS: 10 = POWER BLOCK 1 GENERATING UNIT # 1
  20 = POWER BLOCK 2 GENERATING UNIT # 1

Rev.	Description	Date	Drawn	Chkd. 1	Chkd. 2	Appr.	Review A.I.
1	UPDATED	03-AUG-2011	BVE				
0	FIRST ISSUE	09-FEB-2011	BVE	MJD	PST	TVR	

Revisions

Scale -

Item no. -

Weld no. -

Mark no. -

PROJECT: SCC6-5000F 1x1 Flex Plant™ 10 EL SEGUNDO
CLIENT : Siemens Power Generation

Part list no. -

Title: P&ID HRSG SCR DENOX SYSTEM (PART 1)

Kanaalpark 159. P.O.Box 162. 2300 AD Leiden. The Netherlands
Telephone +31 71 5792444 E-mail info@nem.nl
Telefax +31 71 5792792 Internet www.nem.nl

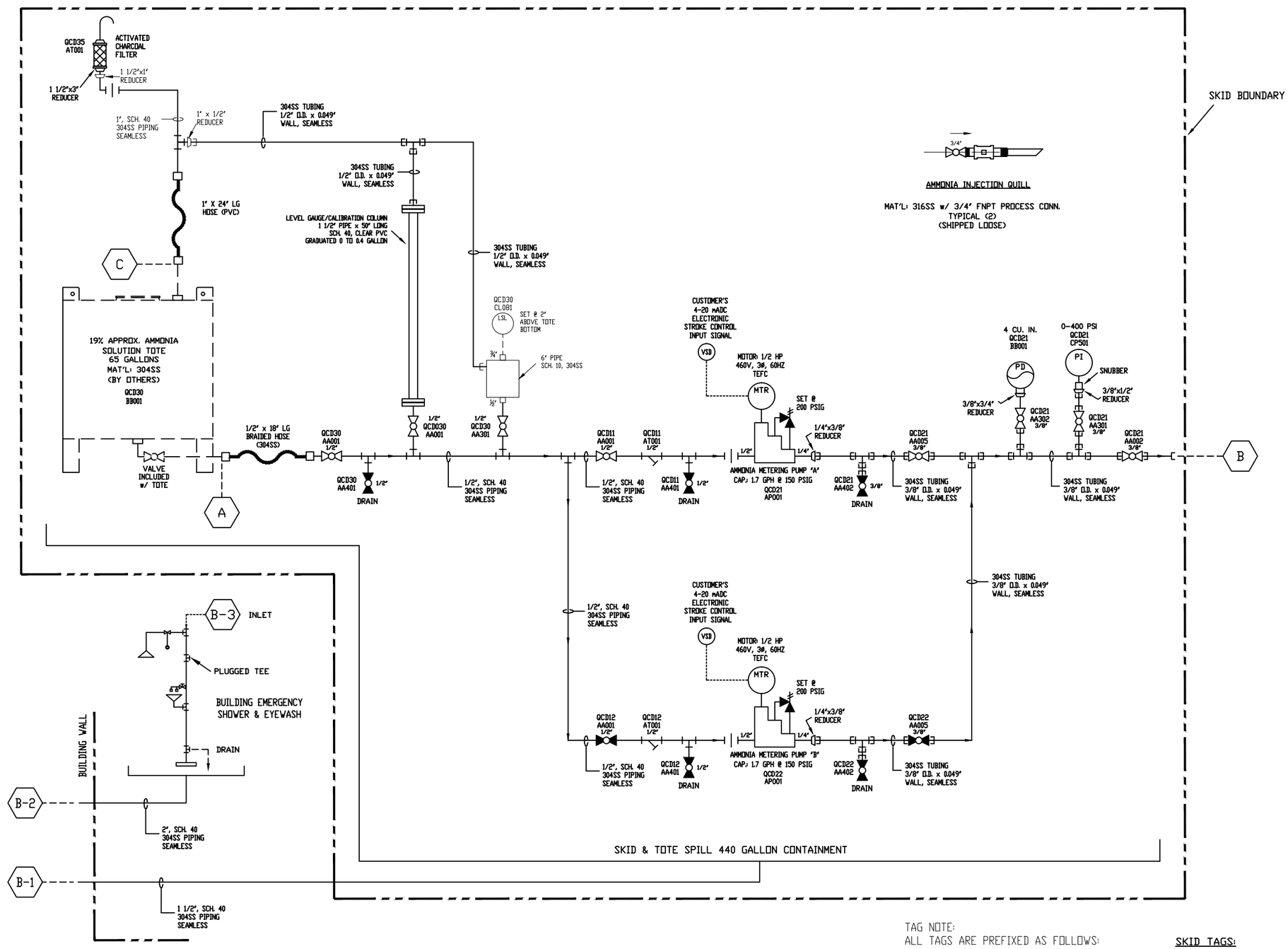
Internal drawing status

Size A0

Drawing no. 21019-105-09

Rev. 1

form.: A0 (1189x841mm)



LEGEND:

VALVE SYMBOLS

NORMALLY OPEN — NORMALLY CLOSED

- BALL VALVE
- REMOTE MOUNTED INSTRUMENT
- FRONT PANEL MOUNTED INSTRUMENT
- CUSTOMER PIPING CONN.
- METERING PUMP WITH DIAPHRAGM & INTERNAL PRESSURE RELIEF VALVE
- PULSATION DAMPENER
- PRESSURE INDICATOR WITH SNUBBER
- "Y" STRAINER
- PIPING UNION
- FLANGE
- REDUCER
- COMPRESSION FITTING
- VARIABLE SPEED MOTOR DRIVE
- PIPE CAP

CUSTOMER CONNECTIONS

- A — AMMONIA TOTE DISCHARGE/PUMP SUCTION: 1/2", HOSE FITTING, 304SS, MNPT
- B — AMMONIA PUMP DISCHARGE: 3/8", O. D. TUBE FITTING, COMPRESSION, 316SS
- C — TOTE VENT: 1", MALE CAMLOCK, POLYPROPYLENE
- B-1 — SKID CONTAINMENT DRAIN: 1 1/2" PIPE, SCH. 40, 304SS, PLAIN END
- B-2 — SHOWER SPILL BASIN PAN DRAIN: 2" PIPE, SCH. 40, 304SS, NPT
- B-3 — BUILDING SAFETY SHOWER & EYEWASH INLET: 1 1/4", FNPT

SKID "A"

TAG NOTE:
ALL TAGS ARE PREFIXED AS FOLLOWS:
UNIT 1 "10...."
UNIT 2 "20...."

SKID TAGS:
SS WITH 3/16" CHARACTERS.
ATTACHED WITH SS WIRE.

SIEMENS POWER GENERATION
EL SEGUNDO POWER ISLAND
EL SEGUNDO, CALIFORNIA
AMMONIA DOSING SYSTEM
SKID TAG: XXXX
PIPING & INSTRUMENT DIAGRAM

S.O. NO. FC0166 | CONTRACT NO. 4500613925

JOHNSON MARCH SYSTEMS, INC.
220 RAILROAD DR.
IVYLAND PA 18974

DR: MG-CDS 04-20-11 APP: JGS 05-03-11
CHK: JGS 05-03-11 APP:
SCALE: NONE SKID "A" - AMMONIA

DWG. NO. D-FC0166-M01 REV. C

REV:	DATE		REV:	DATE		REV:	DATE		REV: C	DATE	REV. TOTE SIZE.	REV: B	DATE	AS BUILT	REV: A	DATE	REV. SHOWER TO 2" NPT
DR:			DR:			DR:			DR: JLG	12/14/12		DR: GPS	4/17/12	REV. HOSE & CONN. SIZE AT TOTE VENT	DR: GPS	9/13/11	REV. STANDPIPE TO 6", SCH 10
CHK:			CHK:			CHK:			CHK: JGS	12/14/12		CHK: JGS	4/17/12	ADD TAG NO. FOR UNIT 1 & 2	CHK: JGS	9/19/11	REV. DAMPENER TO 4 CU. IN.
APP:			APP:			APP:			APP: JGS	12/14/12		APP: JGS	4/17/12		APP: JGS	9/19/11	
APP:			APP:			APP:			APP:			APP:			APP:		

APPENDIX D

OFFSITE CONSEQUENCE ANALYSIS SOFTWARE REPORTS

RMP*Comp

RMP*Comp

WORST CASE RELEASE SCENARIO
CATESTROPHIC RELEASE OF 29.4% NH_4OH FROM THE UNITS 3 & 4 PIPELINE AT ITS LIQUID VOLUME CAPACITY

Estimated Distance Calculation

Estimated distance to toxic endpoint: 0.2 miles (0.3 kilometers)

This is the downwind distance to the toxic endpoint specified for this regulated substance under the RMP Rule. Report all distances shorter than 0.1 mile as 0.1 mile, and all distances longer than 25 miles as 25 miles.

Scenario Summary

Chemical:	Ammonia (water solution)
Initial concentration:	30 %
CAS number:	7664-41-7
Threat type:	Toxic Liquid
Scenario type:	Worst-case
Liquid temperature:	105 F
Quantity released:	277 gallons
Release duration:	10 min
Release rate:	61.2 pounds per minute
Mitigation measures:	NONE
Surrounding terrain type:	Urban surroundings (many obstacles in the immediate area)
Toxic endpoint:	0.14 mg/L; basis: ERPG-2

Assumptions about this scenario

Wind speed:	1.5 meters/second (3.4 miles/hour)
Stability class:	F
Air temperature:	77 degrees F (25 degrees C)

Notes & Additional Assumptions:

- Release Quantity. 277 gallons of 30 percent NH_4OH, the conservatively calculated capacity of the pipeline and the closest solution percentage option available in RMP*Comp.
- Release Height. RMP*Comp assumes that the entire quantity will be released at ground level to form an evaporating pool.
- Wind Speed and Atmospheric Stability. RMP*Comp assumes the atmospheric stability as Class F (stable atmosphere) and wind speed of 1.5 meters per second (3.4 miles per hour). This low wind speed results in a low volatilization rate, but also results in a low rate of dispersion of the vapor as it is carried downwind. In a stable atmosphere, there is little turbulent motion, hence very little mixing occurs, so the ammonia concentration in the accidental release plume would remain high as the vapor is carried downwind.
- Temperature and Humidity: RMP*Comp assumes an ambient temperature of 77 degrees Fahrenheit (F) and 50 percent humidity for estimating the evaporation rate of ammonia into the atmosphere.
- Topography: Selected “Urban (many obstacles in the immediate area)” as opposed to “Rural (terrain generally flat and unobstructed)”.
- Liquid Temperature (release): Entered a value of 105 degrees F. This was the highest daily maximum temperature in the last three years of available data from the closest weather station, Los Angeles WSO Airport Weather Station No. 5114 (2007 to 2010), located approximately 2.5 miles for the ESGS.
- Mitigation Measure: No selection of the “Release in enclosed space, direct contact with outside air” box.

EPA United States Environmental Protection Agency

RMP*Comp

RMP*Comp

ALTERNATIVE RELEASE SCENARIO
RELEASE OF 29.4% NH_4OH FROM UNITS 3 & 4 PIPELINE WITH SUPPLY PUMPS ACTIVE AND A DELAYED RESPONSE TIME

Estimated Distance Calculation

Estimated distance to toxic endpoint: 0.1 miles (0.2 kilometers)

This is the downwind distance to the toxic endpoint specified for this regulated substance under the RMP Rule. Report all distances shorter than 0.1 mile as 0.1 mile, and all distances longer than 25 miles as 25 miles.

Scenario Summary

Chemical:	Ammonia (water solution)
Initial concentration:	30 %
CAS number:	7664-41-7
Threat type:	Toxic Liquid
Scenario type:	Alternative
Liquid temperature:	105 F
Quantity released:	435 gallons
Release duration:	10 min
Release rate:	96.1 pounds per minute
Mitigation measures:	NONE
Surrounding terrain type:	Urban surroundings (many obstacles in the immediate area)
Toxic endpoint:	0.14 mg/L; basis: ERPG-2

Assumptions about this scenario

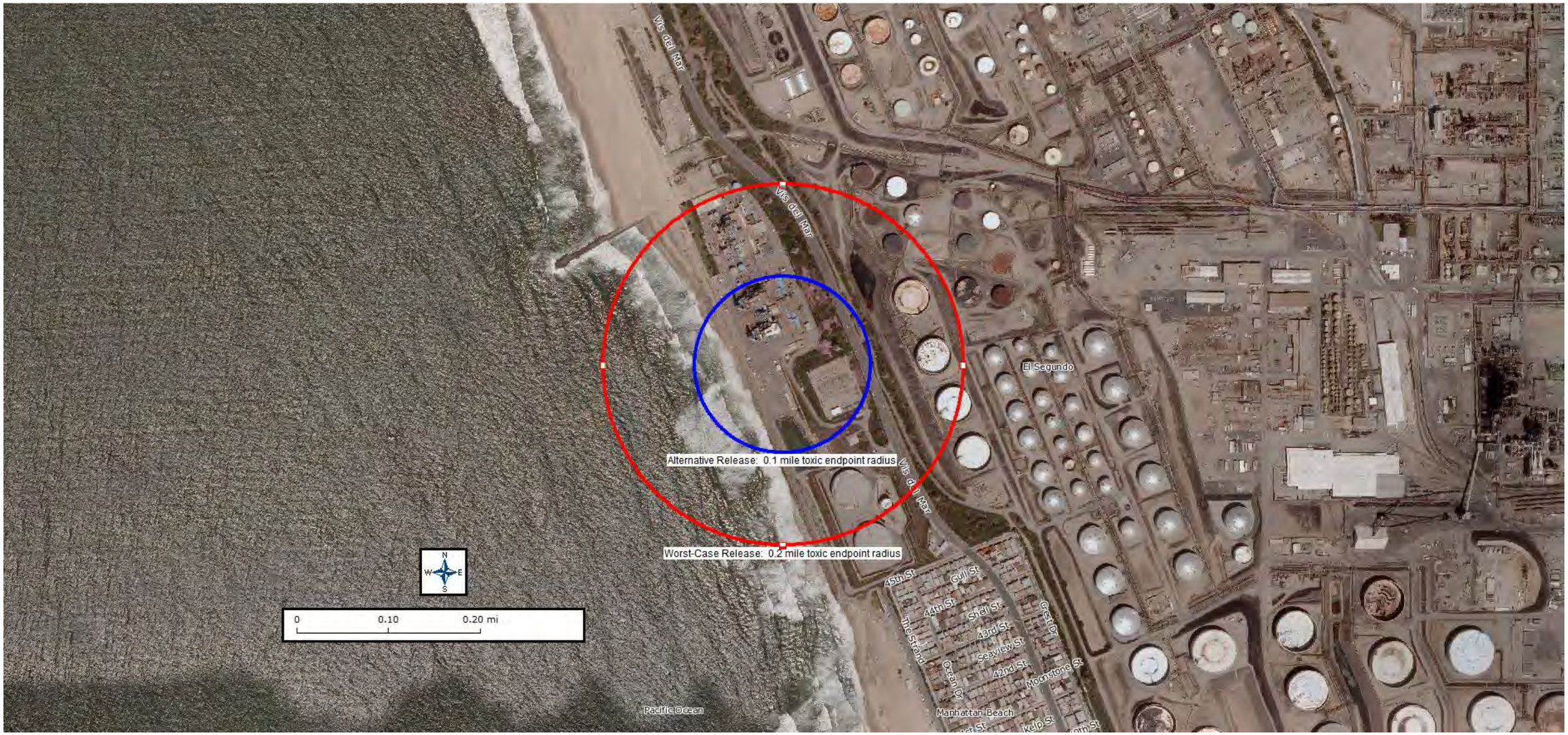
Wind speed:	3 meters/second (6.7 miles/hour)
Stability class:	D
Air temperature:	77 degrees F (25 degrees C)

Notes & Additional Assumptions:

- Release Quantity. 430 gallons of 30 percent NH_4OH, the conservatively calculated capacity of the pipeline and the closest solution percentage option available in RMP*Comp.
- Release Height. RMP*Comp assumes that the entire quantity will be released at ground level to form an evaporating pool.
- Wind Speed and Atmospheric Stability. RMP*Comp assumes the atmospheric stability as Class D (less stable atmosphere) and wind speed of 3.0 meters per second (6.7 miles per hour).
- Temperature and Humidity: RMP*Comp assumes an ambient temperature of 77 degrees Fahrenheit (F) and 50 percent humidity for estimating the evaporation rate of ammonia into the atmosphere.
- Topography: Selected “Urban (many obstacles in the immediate area)” as opposed to “Rural (terrain generally flat and unobstructed)”.
- Liquid Temperature (release): Entered a value of 105 degrees F. This was the highest daily maximum temperature in the last three years of available data from the closest weather station, Los Angeles WSO Airport Weather Station No. 5114 (2007 to 2010), located approximately 2.5 miles for the ESGS.
- Mitigation Measure: No selection of the “Release in enclosed space, direct contact with outside air” box.

APPENDIX D

RELEASE SCENARIO TOXIC ENDPOINT RADIUS
MARPLOT SATELLITE PHOTO



Red Circle: Worst-Case Release Scenario – 0.2 mile toxic endpoint radius for 277 gallon release of 29.4% NH_4OH from the Units 3 & 4 pipeline

Source: MARPLOT® Version 4.2.2

Blue Circle: Alternative Case Release Scenario – 0.1 mile toxic endpoint radius for 435 gallon release of 29.4% NH_4OH from the Units 3 & 4 pipeline with supply pumps active

Release Location Pipeline riser at end of access road and bottom of the hill (Latitude: 33.908773N, Latitude -118.424047W)

APPENDIX E

PHA REVALIDATION REPORT
AMMONIA PROCESS SAFETY MANAGEMENT, INC. (APSM)
SEPTEMBER 20, 2010

&

PHA MODIFICATION REPORT
AMMONIA PROCESS SAFETY MANAGEMENT, INC.

NRG - El Segundo
2012 PHA Modification Report

1. Description:

As a part of the CalARP Risk Management program, NRG - El Segundo must evaluate potential changes to the ammonia system as part of the management of change process. This report will reflect the PHA related to the El Segundo Repowering Project (ESRP).

For this PHA the team utilized the Hazard and Operability (HAZOP) method to evaluate the hazards of the process and document existing controls.

Each team member was provided with access to a set of information that included the following information:

- Most recent PHA Study – 2010
- HAZOP guide words (nodes)
- Piping and Instrumentation Diagrams
- CalARP Risk Management Plan (and current draft revision)

The PHA was conducted during two (2) sessions. Session 1 focused on the 29.4% aqueous ammonia pipeline modifications and took place at the El Segundo Fire Dept. office (see section 3 of this report for meeting attendees). Session 2 took place online via online meeting/teleconference (WebEx) and focused on the 19% aqueous ammonia water treatment/dosing system. The following describes the meeting format and PHA procedure which was followed during each session, respectively:

- Review applicable HAZOP nodes from the proposed change to address the following:
    - The hazards of the process:
    - Engineering and administrative controls applicable to the hazards and their interrelationships.
    - Consequences of failure of engineering and administrative controls;
    - A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.
- Review final changes or corrections.
- Review PHA recommendations and make follow-up assignments.

2. Modification Project Overview

The ESPR will expand the generating capacity by adding two new power blocks (10 and 20) with four new generating units (Units 5, 6, 7 and 8) to the existing Units 3 & 4 power blocks. Two of the new generating units will be natural-gas combustion units (Units 5 & 7) and will utilize the Aqueous Ammonia System in a similar manner as the existing Units 3 & 4. This PHA report incorporates the modifications to the Aqueous Ammonia System based on the engineering designs issued for construction as defined below;

- **Existing Process.** The existing Aqueous Ammonia System consists of a 29.4 percent solution of NH_4OH (29.4% NH_4OH) that is stored in a 20,000 gallon underground storage tank (UST). Supply pumps in the UST transfer the NH_4OH into a pipeline (the Units 3 & 4 Pipeline) that is connected to the following: 1) two selective catalytic reduction device evaporation skids (SCR Skid), one in each of Unit 3 and in Unit 4; and 2) the Unit 3 Chemical Feed Station, a water treatment unit.

- **ESRP Modifications.** The Existing Process will be modified by adding the following:

    - A new pipeline, known as the Units 5 & 7 Pipeline, from the existing UST to a new SCR Skid in each of the two new combustion generating units (Units 5 & 7) will be installed;

    - Two new SCR Skids will be installed, one each in Unit 5 and Unit 7;

    - Two new Ammonia Dosing Skids will be installed, one each in power blocks 10 and 20, that will each containing a 400 gallon portable tote of 19% NH_4OH, piping manifold and pumps that deliver the water treatment additive to the de-mineralized water system used by Units 5, 6, 7 and 8.

3. PHA Team:

Alex Sanchez selected the following personnel for the PHA Revalidation team:

Session 1 (9/5/2012): New Ammonium Hydroxide Piping, Valves and Instrumentation

- Mr. Spencer Collins – Team leader/PHA Facilitator and scribe
- Mr. Joe Ennes - Aqueous Ammonia Supplier - Airgas Specialty Products
- Mr. Alex Sanchez – Environmental and Safety, NRG - El Segundo
- Mr. Glenn Taylor – Taylor Professional Services, Inc.
- Steve Tsumura – El Segundo Fire Environmental Safety
- Tang Hussain – URS PM

- Joel Sieglitz – CBO Program Manager
- LaVesta Kenison – URS Mechanical Engineer
- Steve Odabashian – NRG Energy Environmental Specialist
- Bob Rea – NRG Energy Operations
- Dan Beebe – NRG Energy Operations

Session 2 (10/4/2012): New Ammonium Hydroxide Dosing/Water Treatment (19%)

- Mr. Tyson Alexander - Team leader/PHA Facilitator and scribe (online portion)
- Mr. Joe Ennes - Aqueous Ammonia Supplier - Airgas Specialty Products
- Mr. Alex Sanchez – Environmental and Safety, NRG - El Segundo
- Mr. Glenn Taylor – Taylor Professional Services, Inc.
- Mr. Jared Lee - URS

4. Risk Ranking Technique

Most PHA methodologies use a semi-quantitative approach. Accordingly, this approach is performed using three separate matrices. For each hazard a consequence, frequency, and risk ranking matrix are used. The PHA team used the following matrix to perform the HAZOP risk ranking.

5. Findings

The recommendations listed here are from the review related to this modification project;

1. Install vapor detectors to detect releases from single-wall piping components
2. Verify that all equipment and valves are safely accessible to personnel wearing chemical protective equipment during an emergency.
3. Verify proper guarding of pipeline and chemical dosing building where exposed to vehicle traffic.
4. Consider establishing a regularly scheduled comprehensive inspection of the entire system by a qualified person (aboveground containment piping, flanges, end seals, corrosion, annular space for moisture, SCR skid piping manifolds, ammonia dosing skid manifolds, and braided hoses/connections to totes, etc.
5. Inspection or replacement of the ammonia dosing skid activated charcoal filters on the vent line to replace the media as required by the manufacturer and the air pollution control permit.
6. Incorporate new equipment into operating procedures. For example, the UST monitoring plan (Station Order EL A-123), the daily environmental inspection report, the locking of critical valves station order, ammonia dosing skid braided hose, etc.
7. Revise station order EL A-122 for chemical transfers to incorporate the safe delivery and transfer of NH404 totes, including the placement, setup and hookup

of the tote (and removal of tote from) the ammonia dosing skid in a manner that prevents possible releases.

8. Verify and document the specifications and safety control features of the tote that will be supplied by the manufacturer (e.g., US DOT packaging specs, pressure rating, PRV set points, vacuum breaker and set point, etc.)
9. Obtain written statement of the specs and compatibility of materials including connections (threaded vs. bonded) and durability (breakage, transparency, etc.) to withstand 19% NH404 used in liquid level sight glass that is shown on drawing No. D-FC0166-M01 as standpipe, Sch. 40 clear PVC, graduated.
10. Verify safety considerations for tote placement and hookup by operators including;
    - Material handling of tote and clearances for placement on skid
    - Seismic stabilization or bracing
    - Controls to safety isolate (valving) and bleed (drain to what containment) the two braided hose connections to the tote to allow safe connection/disconnection without vapor leaks
    - Controls to safety isolate the bleed the activated charcoal filter, PVC graduated standpipe (sight level gauge) and level switch pipe to allow for maintenance
    - Adequacy of the 12" length of the braided hose connection to facilitate hook-up (may need 18" or more).

11. Identify the flow direction to/from activated charcoal filter (air intake as tote is drawn down vs. absorb ammonia vapors) on drawing No. D-FC0166-M01. Evaluate the need for a check valve and/or PRV and the set point on the vent line to control flow.

12. Verify that the internal PRV on the ammonia metering pumps discharge back to suction and not to atmosphere are suggested by the symbol on drawing No. D-FC0166-M01. Also verify that the relief valve on the pumps cannot be manually isolated or bypassed.

13. Identify specifications and design standards for the NH404 valves, flanges, gaskets, tubing, etc. on drawing (or reference specification), the adequacy of protection of the discharge line to the condenser tank to prevent accidental damage; and to confirm that a check valve is available to prevent backflow into the NH404 tubing from the condenser tank.

14. Verify the access, isolation, and safe draining methods for the chemical dosing building floor drains and the ammonia dosing skid secondary containment drains in the event of an ammonia release.

A comprehensive list of each of the recommendations and each of the checklists that were reviewed is included in Appendix A.

Issuance of this report represents completion of the PHA. It is now the responsibility of the NRG - El Segundo CalARP/RMP team to systematically prioritize and address each recommendation. Every recommendation should be resolved in a timely manner. Actions to be taken as a result of the PHA should be documented and tracked, as well as communicated to all affected employees.

Appendix A
2012 PHA Recommendations and Checklists

HAZOP Recommendation Summary

Guideword	Before Rank	Recommendation	After Rank	Status / Controls	Actions Taken	Person Responsible	Sch. Comp. Date	Comp. Date
7.2 REVERSE FLOW	**Undesirable** - *Must be improved*	Verify that condenser tanks are equipped with a check valve to prevent reverse flow back to the tote skid	**Acceptable** - *Acceptable with controls*					
7.4 LOSS OF CONTAINMENT		1. Verify material used in sight glass (P&ID indicates it is schedule 40, clear PVC). Verify if it is a screwed fitting vs. glued fittings, etc. 2. Verify/Confirm detection measures relative to the overhead tubing (after the metering pumps).						
7.6 MORE PRESSURE	**Undesirable** - *Must be improved*	1. Evaluate the need for a check valve near the charcoal filter to prevent vapor from continually escaping while the tote is connected. 2. Confirm direction of flow on the charcoal filter.						
7.17 CONTAMINATION	**Acceptable**	Verify safe containment of all drains within the containment area (in the event of release/spill to the containment area).						
7.18 RELIEF VALVE FAILURE	**Undesirable** - *Must be improved*	1. Verify the configuration (specs, pressure rating, etc.) of the tote in order to confirm the need for a PRV on the tote or the piping (up to the charcoal filter). 2. Verify PRV configuration on pumps (designated on specs as internal, but P&ID indicates that the PRV relieves to atmosphere). 3. Verify that pump PRV's cannot be manually bypassed						
7.28 SAFETY		Verify design in order to place isolation valves on both braided lines (and the charcoal filter for maintenance), and level switch pipe in order to secure the area during tote switches and maintenance activity (block and bleed valves).						

7.31 SITE ISSUES	**Acceptable** *- Acceptable with controls*	1. Verify that ammonia detection is in place (internal) to advise operations/maintenance personnel (at each door) of potential ammonia leak inside the tote skid. 2. Verify that ventilation fan or similar is in place (specs to be determined) in order to prevent a contained release in the tote skid.						
8.1 NO FLOW	**Acceptable** *- Acceptable with controls*	Confirm proper design and installation of bollards/guarding for all exposed piping. Ensure that barriers are engineered to withstand vehicular impact at top @ curve and @ riser location.	**Acceptable**			LaVesta Kenison		
8.4 LOSS OF CONTAINMENT	**Acceptable**	Confirm proper gaskets are installed at all new ammonia line flanges.	**Acceptable**			LaVesta Kenison		
8.5 LESS FLOW	**Acceptable**	Confirm that asbuilt P&IDs are in place that match SOPs at completion of commissioning.	**Acceptable**			Dan Beebe		
8.22 SERVICE FAILURE	**Acceptable**	Evaluate battery backup and/or installation of UPS backup power for leak detection system.	**Acceptable**			Alex Sanchez		
8.23.1 MISSING AMMONIA DETECTION	**Acceptable**	Install ammonia vapor detectors at ammonia skid locations.	**Acceptable**			Bob Rea		
8.27 SPARE EQUIPMENT	**Acceptable**	Review mechanical integrity policy within RMP to ensure QA policies/procedures are in place.	**Acceptable**			Alex Sanchez		
8.31 SITE ISSUES	**Acceptable** *- Acceptable with controls*	Review valve accessiblity and labeling (e.g., pipe color coding, direction arrows, valve tags, etc.) for new ammonium hydroxide system.	**Acceptable**			Dan Beebe		

Nodes : Ammonium Hydroxide Totes

Guideword / Deviation	Equipment/ Item	Cause	Consequence	Risk Rank			Existing Controls	Recommendation	Risk Rank		
				C	F	R			C	F	R
7.1 NO FLOW		Empty tank	loss of product, operational issue	IV	B	4 Acceptable	bill of lading, vendor agreement				
7.2 REVERSE FLOW		pressure difference, lack of check valve or check valve failure	over-pressure or overfill of tote	II	B	2 Unacceptable *Must be improved*	operator experience, sight glass	Verify that condenser tanks are equipped with a check valve to prevent reverse flow back to the tote skid	II	C	3 Acceptable *Acceptable with controls*
7.3 MORE FLOW		excess flow through totes, over-pressure	additional product	IV	C	4 Acceptable	totes are limited in quantity				
7.4 LOSS OF CONTAINMENT		potential incompatibility of materials used in sight glass	incompatible materials could lead to a leak/release					1. Verify material used in sight glass (P&ID indicates it is schedule 40, clear PVC). Verify if it is a screwed fitting vs. glued fittings, etc. 2. Verify/Confirm detection measures relative to the overhead tubing (after the metering pumps).			
7.5 LESS FLOW		low liquid in totes, see NO FLOW	operational	IV	C	4 Acceptable	see NO FLOW				
7.6 MORE PRESSURE		higher temperature	increased pressure and release through charcoal filter	III	A	2 Unacceptable *Must be improved*		1. Evaluate the need for a check valve near the charcoal filter to prevent vapor from continually escaping while the tote is connected. 2. Confirm direction of flow on the charcoal filter.			
7.7 LESS PRESSURE		less temperature	inability to offload tote	III	C	4 Acceptable	operator experience				
7.8 MORE LEVEL		See MORE FLOW									
7.9 LESS LEVEL		See Less FLOW									
7.10 MORE TEMPERATURE		This would cause more pressure	See MORE PRESSURE								
7.11 LESS TEMPERATURE		cold season, colder weather	Less pressure				See LESS PRESSURE				
7.12 MORE VISCOSITY		no issues									
7.13 PARTIAL ACTION		partial completion of offload SOP, operator distraction, etc.	overfill, underfill, lack of disconnect, potential leak	III	C	4 Acceptable	Operator training and experience, written SOPs, detection.				
7.16 COMPOSITION CHANGE		water contamination	dilution of NH404	III	C	4 Acceptable	closed system (tight connection)				
7.17 CONTAMINATION		NH404 release	exposed area and spill/further leak issue	III	C	4 Acceptable	containment area, operator training and experience, drains	Verify safe containment of all drains within the containment area (in the event of release/spill to the containment area).			

Nodes : Ammonium Hydroxide Totes

Guideword / Deviation	Equipment/ Item	Cause	Consequence	Risk Rank			Existing Controls	Recommendation	Risk Rank		
				C	F	R			C	F	R
7.18 RELIEF VALVE FAILURE		Faulty valves, poor design, lack of PRV on tote	increased pressure, equipment rupture, NH404 release	II	B	2 Unacceptable *Must be improved*	Unknown (no PRV's shown on drawing).	1. Verify the configuration (specs, pressure rating, etc.) of the tote in order to confirm the need for a PRV on the tote or the piping (up to the charcoal filter). 2. Verify PRV configuration on pumps (designated on specs as internal, but P&ID indicates that the PRV relieves to atmosphere). 3. Verify that pump PRV's cannot be manually bypassed			
7.20 SAMPLING		N/A no sampling will take place									
7.21 CORROSION/ EROSION		lack of PM program or inspection	accelerated wear, potential leak during offload	III	C	4 Acceptable	PM program, contractor qualification, offload checklist				
7.22 SERVICE FAILURE		See NO FLOW									
7.23 ABNORMAL OPERATION		weather or other conditions	abnormal operations could affect performance and cause release or operator error.	III	C	4 Acceptable	Operator training and experience, SOPs				
7.24 MAINTENANCE EXPERIENCE		lack of training, experience	operator error, NH404 release	III	C	4 Acceptable	containment, detection, operator training and experience, PPE.				
7.26 IGNITION		flames, fire, smoking	potential explosion or rupture of tote	II	D	3 Acceptable *Acceptable with controls*	NH404 concentration, ventilation				
7.27 SPARE EQUIPMENT		faulty equipment, lack of PM on spare equipmnet	hose failure, valve failure	III	C	4 Acceptable	PM program, offload checklist				
7.28 SAFETY		potential safety issue during tote switch	lack of isolation control during switching of totes					Verify design in order to place isolation valves on both braided lines (and the charcoal filter for maintenance), and level switch pipe in order to secure the area during tote switches and maintenance activity (block and bleed valves).			
7.29 STARTUP		failure to perform SOP correctly	problem/leak during offload	III	C	4 Acceptable	SOP, operator training and experience				
7.30 SHUTDOWN		improper completion of SOP (not complete)	See PARTIAL ACTION								
7.31 SITE ISSUES		layout of tote skid or other NH404 equipment	increased likelihood for impact, error, confusion	III	B	3 Acceptable *Acceptable with controls*	operator training and experience	1. Verify that ammonia detection is in place (internal) to advise operations/maintenance personnel (at each door) of potential ammonia leak inside the tote skid. 2. Verify that ventilation fan or similar is in place (specs to be determined) in order to prevent a contained release in the tote skid.			
7.32 HUMAN FACTORS		lack of training	improper actions, failure to perform SOP				See PARTIAL ACTION, MAINTENANCE EXPERIENCE				

Nodes : Ammonium Hydroxide Totes

Guideword / Deviation	Equipment/ Item	Cause	Consequence	Risk Rank			Existing Controls	Recommendation	Risk Rank		
				C	F	R			C	F	R
7.33 EXTERNAL EVENTS		See SITE ISSUES and previous PHA records. Seismic supports have been recommended.									
7.34 SIGNAGE		lack of signage or improper signage on totes	operator offloads wrong chemical or is unsure of correct tote	II	C	3 **Acceptable** *Acceptable with controls*	Vendor agreement/tote signage				

Nodes : New Ammonium Hydroxide Piping, Valves and Instrumentation

Guideword / Deviation	Equipment/ Item	Cause	Consequence	Risk Rank			Existing Controls	Recommendation	Risk Rank		
				C	F	R			C	F	R
8.1 NO FLOW		Storage tank is empty; valve is shut incorrectly; pump is shut off. Line restriction. Line shear.	Ammonia exposure due to line shear at bottom of hill.	III	B	3 Acceptable *Acceptable with controls*	Liquid leak detection within interstitial space between ammonia line and ammonia line containment. Low pressure pump trip. Leak detection triggers ammonia pump shutdown and general alarm.	Confirm proper design and installation of bollards/guarding for all exposed piping. Ensure that barriers are engineered to withstand vehicular impact at top @ curve and @ riser location.	III	C	4 Acceptable
8.2 REVERSE FLOW		NO ISSUE due to uphill location of storage tank.					check valves on skid part of design.				
8.3 MORE FLOW		Excess flow due to control failure @ VFD.	Operational Consequences: Ammonia Slip	IV	C	4 Acceptable	At forwarding pump location, excess ammonium hydroxide flow. Flow transmitter at the skid.				
8.4 LOSS OF CONTAINMENT		Ammonia leak due to flange / bolt corrosion at the skid location. Gasket Failure	Possible minor ammonia leak due to operator error during maintenance operations.	III	C	4 Acceptable	Stainless flanges; stainless bolts are part of specification. Operator training; SOPs and Maintenance procedures are under development, MOC process dictates all ammonia system repairs and maintenance.	Confirm proper gaskets are installed at all new ammonia line flanges.	III	C	4 Acceptable
8.5 LESS FLOW		Pump malfunction; Operator Error; refer to NO FLOW for other causes	NOV issues (operational)	III	C	4 Acceptable	refer to NO FLOW item; real-time monitoring by DCS; alarms in the control room.	Confirm that asbuilt P&IDs are in place that match SOPs at completion of commissioning.	III	C	4 Acceptable
8.6 MORE PRESSURE		Failure of relief valve on the forwarding pump.	Operational consequences.	IV	C	4 Acceptable	Positive displacement pumps; preventative maintenance system. Refer to MORE FLOW. High pressure alarm at skid.				
8.7 LESS PRESSURE		refer to LESS FLOW									
8.8 MORE LEVEL		High level in storage tank causes high pressure; refer to MORE PRESSURE.									
8.9 LESS LEVEL		refer to NO FLOW.									
8.10 MORE TEMPERATURE		Brush fire or hot work causes pipe rupture	Increased temperature of ammonium hydroxide.	III	C	4 Acceptable	schedule 80 stainless steel piping. Secondary containment on all piping (FRP on underground and carbon steel above ground)				
8.11 LESS TEMPERATURE		no issues									
8.12 MORE VISCOSITY		no issues									
8.13 PARTIAL ACTION		Incomplete maintenance operations	Ammonia release due to starting the system	III	C	4 Acceptable	LOTO; Operator training; SOPs, Maintenance Procedures (developed during MOC process); ammonia line breaking procedure				
8.15 STARTUP		refer to PARTIAL ACTION;									
8.16 COMPOSITION CHANGE		Unintended delivery of other concentration of ammonium hydroxide.	WCS for ASP: 19% (operational only)	IV	C	4 Acceptable	LOA for ammonia; driver and operator training; SOP is in place which requires that unloading operations be accompanied by plant personnel.				

Nodes : New Ammonium Hydroxide Piping, Valves and Instrumentation

Guideword / Deviation	Equipment/ Item	Cause	Consequence	Risk Rank			Existing Controls	Recommendation	Risk Rank		
				C	F	R			C	F	R
8.17 CONTAMINATION		Refer to previous PHA studies. Introduction of Sodium Hypochlorite into Ammonium Hydroxide.	Noxious gases; however, no exothermic reaction.	IV	D	4 Acceptable	Accompanied unloading operations; SOPs; contractor qualification.				
8.18 RELIEF VALVE FAILURE		refer to ammonia storage tank node/checklist within original PHA for vessel; also refer to MORE PRESSURE for pump recirculation relief valves; no additional issues.									
8.19 INSTRUMENTATION		Dilution air flow failure	Operational consequences	IV	C	4 Acceptable	Ammonia flow trips if dilution air is malfunctionioning and/or temperature of SCR is out of range.				
8.20 SAMPLING		N/A: no sampling operations									
8.21 CORROSION/ EROSION		refer to LOSS OF CONTAINMENT									
8.22 SERVICE FAILURE		Power failure causes LESS FLOW; power failure to leak detectors	Lack of power for leak detection leads prevents timely recognition of release.	III	C	4 Acceptable	All ammonia systems fail closed by design. Operator training; secondary contained piping. Leak detection system would prevent startup.	Evaluate battery backup and/or installation of UPS backup power for leak detection system.	III	D	4 Acceptable
8.23 CONTROL ROOM EXPOSURE		Ammonia line ruptures outside 4KV wall.	High concentration of ammonia in the control room.	IV	C	4 Acceptable	Operator training				
8.23.1 MISSING AMMONIA DETECTION		Ammonia release at skid location	Ammonia exposure to operators	III	C	4 Acceptable	Operator training	Install ammonia vapor detectors at ammonia skid locations.	III	C	4 Acceptable
8.24 MAINTENANCE OR OPERATIONS EXPERIENCE (NEAR MISSES, EXISTING PROCESS)		LOTO violation: maintenance personnel (contractor) performs grinding on ammonia piping.	This occurrence did not lead to a release due to discovery by plant personnel. Could have led to significant release	II	C	3 Acceptable *Acceptable with controls*	Operator training; contractor qualification; leak detection; MOCs and SOPs; periodic compliance audits; PPE; contractors are trained on NRG LOTO procedures				
8.25 RELEASE HISTORY		No releases have occurred during the past five years									
8.26 IGNITION		No issues									
8.27 SPARE EQUIPMENT		Incompatible, out of spec, equipment is used for spare parts (copper alloys).	Accelerated corrosion and/or failure due to use of improper parts.	III	C	4 Acceptable	Materials specification is in place for existing system. Equipment specification will be provided by engineers.	Review mechanical integrity policy within RMP to ensure QA policies/procedures are in place.	III	C	4 Acceptable
8.28 OSHA MANDATED SAFETY		Procedures not followed relative to PPE requirements	Ammonia exposure	III	C	4 Acceptable	Site Safety Manual and related training is in place and functioning				
8.30 SHUTDOWN		Operator error during system shutdown for maintenance operations.	Possible ammonia exposure				SOPs are in place for existing system. refer to LESS FLOW (procedure development)				

Nodes : New Ammonium Hydroxide Piping, Valves and Instrumentation

Guideword / Deviation	Equipment/ Item	Cause	Consequence	Risk Rank			Existing Controls	Recommendation	Risk Rank		
				C	F	R			C	F	R
8.31 SITE ISSUES		Valves are not accessible to operators during attempt to isolate system during release.	Prolonged release	II	C	3 **Acceptable** *Acceptable with controls*	System designed by qualified engineers. Operator training	Review valve accessiblity and labeling (e.g., pipe color coding, direction arrows, valve tags, etc.) for new ammonium hydroxide system.	III	C	4 **Acceptable**
8.32 HUMAN FACTORS		Human error due negligence	Possible ammonia exposure	III	C	4 **Acceptable**	Site Safety Manual is in place and up to date. Employee Training; SOPs; contractor evaluation				
8.33 EXTERNAL EVENTS		refer to site Risk Management Plan (RMP) External Events Analysis for all possible external events, security issues and mitigations in place.									
8.34 SIGNAGE		refer to SITE ISSUES									

NRG - El Segundo
September 20, 2010 PHA Revalidation Report

1. Description:

As a part of the CalARP Risk Management program, NRG - El Segundo must revalidate the Process Hazard Analysis (PHA) every five years. The first PHA was performed at the facility in 1999 and was last revalidated in 2004..

For 2010 the team leader selected the Update and Revalidate method to evaluate the previous PHA studies and verify that the previous PHA still accurately addressed the hazards of the process and adequate controls are provided to manage the hazards. .

Each team member was provided with a set of information that included the following information:

- Original PHA Study – March 1999, and follow up Revalidation study – June 2004
- Human Factors Node & Findings Report Study Sheets
- Piping and Instrumentation Diagrams
- CalARP Risk Management Plan

The team met via online meetings to discuss the following:

- Review all nodes from previous PHA studies and revalidation for the following:
    - The hazards of the process:
    - The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace;
    - Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases.
    - Consequences of failure of engineering and administrative controls;
    - Facility siting;
    - Human factors; and
    - A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.
- Review final changes or corrections.
- Review Original PHA recommendations and 2004 Revalidation recommendations and follow-up assignments and evaluated possible need for additional recommendations.

2. Aqueous Ammonia System Process Overview

Nitrogen oxides (NO_x) are produced as part of the combustion process and, if not controlled properly, is emitted to the atmosphere along with the other flue-gas constituents (mostly nitrogen, carbon dioxide, and water vapor). Selective Catalytic Reduction (SCR), a proven air pollution control technology, is used with a reducing agent (typically ammonia) to reduce NO_x to nitrogen (N_2) and water in the presence of a catalyst. In the SCR system, ammonia is injected into the boiler flue gas. Aqueous ammonia used for SCR systems is stored in a 20,000-gallon, double-walled underground storage tank. The storage tank is an American Society of Mechanical Engineers (ASME)-registered U-stamped pressure vessel designed for ammonia service. The tank is constructed with a double-wall design to minimize potential aqueous ammonia leakage to the environment. The inter-wall space is isolated from the main storage space and contains a leak detection system to monitor for any liquid. The aqueous ammonia is pumped through aboveground and belowground 2-inch pipe to the aqueous ammonia vaporizer skid for Boiler Units 3 and 4. In addition, a ¾-inch stainless steel pipe carrying aqueous ammonia is routed to a chemical treatment system. A 2-inch pipe branch also runs to the demineralizer building. This line has subsequently been plugged and seal welded to prevent any leakage. Approximately 1,200 feet of 2-inch piping runs from the aqueous ammonia storage tank to Unit 4 and additional 250 feet of 2-inch piping to connect to Unit 3. The belowground pipe is also double-walled with leak detection.

The aqueous ammonia storage tank is filled via a vendor's 6,000-gallon tanker truck with deliveries scheduled at regular intervals based upon ammonia consumption. Supply hoses are connected to the storage tank. Transfer pumps, hose-purge equipment, and loading controls are provided on the tanker truck itself. The loading system design incorporates both liquid-fill hose and vapor-return hose to retain a closed system and minimize potential leakage. All lines, upon completion of filling operations, are purged with compressed air before disconnection.

3. PHA Team:

Alex Sanchez selected the following personnel for the PHA Revalidation team:

- Mr. Tyson Alexander - Team leader/PHA Facilitator and scribe. Tyson is an employee of Ammonia Process Safety Management.
- Mr. Joe Ennes - Aqueous Ammonia Supplier - Airgas Specialty Products
- Mr. Greg Munsell - NRG - El Segundo Operator
- Mr. Alex Sanchez – Environmental and Safety, NRG - El Segundo
- Mr. Steve Odabashian – Environmental and Safety, NRG - El Segundo

4. Risk Ranking Technique

Most PHA methodologies use a semi-quantitative approach. Accordingly, this approach is performed using three separate matrices. For each hazard a consequence, frequency, and risk ranking matrix are used. The PHA team used the following matrices to perform the What-If analysis. For consistency purposes, the risk-ranking matrix used for this PHA uses the same priority numbers as defined in the Hazards Evaluation Study, dated 4/16/99 as well as the revalidation dated June of 2004.

Table 4-1
Consequence Categories Matrix

	Worker Safety	Public Safety	Environment	Economic (Equipment and Product Loss) ($1,000)
Catastrophic 1	Fatality or multiple serious injuries	Fatality or multiple serious injuries	Business threatening	>= 10,000
Severe 2	Single disabling injury	Hospitalization or serious injury	Remediation required	1,000 to 10,000
Moderate 3	Hospitalization or lost-time injury	Minor medical attention	Report to agencies	100 to 1,000
Low 4	Reportable or equivalent	None	None	10 to 100

Table 4-2
Frequency Levels Matrix

	Frequency	Comments
Very High 1	> 1 in 10 years	It is likely that the event has occurred at the site, if the facility is more than a few years old.
High 2	1 in 10 years to 1 in 100 years	Might happen in a career.
Medium 3	1 in 100 years to 1 in 1000 years	Conceivable–has never happened in the facility being analyzed, but has probably occurred in a similar plant somewhere else.
Low 4	< 1 in 1000 years	Essentially impossible.

Table 4-3
Risk Ranking Matrix

		Consequence			
		Low	Moderate	Severe	Catastrophic
Frequency	Low	4	4	3	2
	Medium	4	3	2	2
	High	3	2	2	1
	Very High	2	2	1	1

Risk 1 –Requires prompt action and the option of doing nothing is not an option. A "1" risk is urgent. If the 1-level risk represents an emergency situation, management must implement immediate temporary controls while longer-term solutions are being investigated.
Risk 2 –must be reduced, but there is time to conduct more detailed analyses and investigations. Remedy is expected within approximately 90 days. If the resolution is expected to take longer than this, then an immediate temporary control must be put in place to reduce risk.
Risk 3 –The risk is significant. However, cost consideration can be factored into the final action taken, as can normal scheduling constraints, such as availability of spare parts or timing of plant turnarounds. Resolution of the findings must occur within approximately 18 months.
Risk 4 –Requires action, but is of low importance.

5. Findings

The revalidation team reviewed all previous PHA studies and revalidation. All previous analysis information was found to be correct and current.

All previous recommendations were evaluated for applicability and status. Two new recommendations were made.

1. Due to the acquisition of PDP, review the unloading SOP together with Airgas a second time for consistency. This recommendation was completed shortly after the 2004 revalidation, but due to a merger of the supplier a review of the SOP was recommended.

2. Review the P&IDs for accuracy based on system changes that took place per recommendations in the 2004 PHA. Namely items 12-14 of the Worksheet Report Checklist.

Each of the checklists that was reviewed is included in Appendix A.

Issuance of this report represents completion of the PHA revalidation. It is now the responsibility of the NRG - El Segundo CalARP team to systematically prioritize and address each recommendation. Every recommendation should be resolved in a timely manner. Actions to be taken as a result of the PHA should be documented and tracked, as well as communicated to all affected employees.

Appendix A
2010 PHA Checklists

#	What-If Findings Report Checklist	Suggested Recommendations	Risk Rank	Node	Action Items	Document Reference	2010 PHA Revalidation Notes / Verification of Completion	Status	Due Date
1.1	Emergency condition with aqueous ammonia unloading procedure requires action by NRG operator.	Change ESGS operating procedures to be consistent with the suppliers standard operating procedures (SOP).	2	Delivery truck and unloading system		PDP SOP-AQ3 and ESGS EL A-123	Due to the acquisition of PDP, review the unloading SOP together with Airgas a second time for consistency.		10/31/2010
1.4	Delivery truck is damaged while moving into unloading position causing aqueous ammonia leak.	Update ESGS procedure EL A-123 to ensure proper positioning of the delivery truck and train operators on delivery and fill procedures.	3	Delivery truck and unloading system	The Maintenance Ammonia Vapor Scrubber skid should be relocated to eliminate potential of being struck by delivery truck.	ESGS EL A-123	Vapor skid has been removed	Complete	
2.1	There is a power failure and a leak and the leak detectors do not function.		4	Aqueous ammonia storage tank	Explore adding an uninterruptible power supply (UPS) system.	Drawing 468247-2	Uninterruptible power supply was evaluated and determined to be not cost effective. In addition, a power outage would trip the pumps, and no deliveries would be accepted.	Complete	
2.2	There is a power failure and a leak and the vapor detectors do not function.		2	Aqueous ammonia storage tank	Explore adding a UPS system.	Drawing 468247-2	See item 2.1	Complete	
2.4	Pressure relief valve on aqueous ammonia storage tank fails.		4	Aqueous ammonia storage tank	Consider increasing inspection and preventive schedules of relief valves.	Drawing 468247-2	Relief valves have been included into the PM schedule.	Complete	
2.5	Pressure vacuum breaker on aqueous ammonia storage tank fails.		3	Aqueous ammonia storage tank	Consider increasing inspection and preventive schedules of vacuum breaker.	Drawing 468247-2	Vacuum breaker has been included into PM schedule	Complete	
2.6.1	Aqueous ammonia storage-tank tank-level gauge does not operate and tank is overfilled.	Increase frequency of routine maintenance.	4	Aqueous ammonia storage tank		Drawing 468247-2	Maintenence is performed on the tank twice daily (visual and alarm testing), and an annual inspection is performed that includes the level gauge.	Complete	

2.6.2	Aqueous ammonia storage tank pressure gauge on discharge does not operate.	Change procedure for routine observation and follow-up maintenance.	4	Aqueous ammonia storage tank		Drawing 468247-2	Maintenence is performed on the tank twice daily (visual and alarm testing), and an annual inspection is performed that includes the level gauge.	Complete
2.6.3	Aqueous ammonia storage tank instrument transmitters fail.	Perform routine maintenance upon detection.	4	Aqueous ammonia storage tank		Drawing 468247-2	See items 2.6.1 and 2.6.2. In the event of deficiencies found during rounds, workorders would be created to correct the deficiency.	Complete
3.1.1a	There is a leak in the piping downstream of the flow		2	Aqueous ammonia	Explore adding instrumentation to the	Figure 1-1	Completed in Dec. 2009.	Complete
3.1.1b		Isolate the 3/4-inch diameter pipe feeding chemical treatment system by closing the branch valve at the 2-inch aqueous ammonia pipe.			For 3/4-inch diameter pipe feeding chemical treatment explore adding pressure switch with appropriate alarms and shutdown.	Figure 1-1	Installation of vapor detectors along full length of piping was completed in 2007	Complete
3.1.2	There is a leak in the piping upstream of the flow control meter in the Units #3 and4 structure				Subsequently, the 2-inch branch line to demineralizer building was plugged and seal welded.	Figure 1-1	Completed	Complete
5.1	There is no water flow to the Maintenance Ammonia Vapor Scrubber skid during maintenance activities.		2	Maintenance Ammonia Vapor Scrubber skid	Investigate supplying portable water-filtration system, or plant water.		Vapor skid has been removed. SOP was also modified to include distilled water brought to the tank by the vendor	Complete
5.2	There is a mechanical or power failure during the use of the Maintenance Ammonia Vapor Scrubber skid.	Have maintenance support on standby during this operation.	3	Maintenance Ammonia Vapor Scrubber skid			SOP indicates that maintenance support will be on standby.	Complete
5.3	The water flow meter fails during the use of the Maintenance Ammonia Vapor Scrubber skid.		2	Maintenance Ammonia Vapor Scrubber skid	Confirm backup water supply is available and incorporated in operating procedures.		See 5.1	Complete

5.4	Maintenance Ammonia Vapor Scrubber skid.	Routine inspection and testing to ensure proper working order.	2	Maintenance Ammonia Vapor Scrubber skid		See 1.4	Complete	

Item #	Human Factors Checklist Question	Finding	Recommendations/ Actions		2010 PHA Revalidation Notes / Verification of Completion	Status	Due Date
1	Has the operator's mobility been considered in selecting the design of protective gear for certain tasks, including emergency response?	Yes	None		N/A	Complete	
2	Is there a formal mechanism for correcting human factors deficiencies in the human-machine interface?	Yes	None		N/A	Complete	
3	Are means provided to allow operators to compensate for operator errors?	Yes	None		N/A	Complete	
4	Can personnel detect an error that a third-party is about to make with sufficient time to correct for that error?	Sometimes	Increase training and change operating procedures.		Annual training has been updated, and SOPs have been modified where needed.	Complete	
	Do the working areas associated with the	Should be verified.	Egress areas in aqueous ammonia		Adequate egress has been verified and emergency		

5	aqueous ammonia layout provide for emergency egress or access?		structure needs to be explored and delineated in the emergency preparedness and emergency response plan.	action/evacuation training has taken place.	Complete
6	Is the ambient temperature at a tolerable level?	Yes	None	N/A	Complete
7	Is noise maintained at a tolerable level?	Proper hearing protection provided.	None	N/A	Complete
8	Is lighting sufficient for all operations?	Yes, lighting exists at the ammonia storage structure and throughout the facility.	None	N/A	Complete
9	Are adequate supplies of protective gear readily available for routine and emergency use?	Yes	None	N/A	Complete
10	Are all controls accessible?	Yes	None	N/A	Complete
11	Is access adequate for routine operation and maintenance of all equipment?	Yes	None	N/A	Complete
	Is all-important equipment (vessels, pipes, valves,	Should be verified.	Labeling of system components needs to		

12	instruments, controls, etc.) clearly labeled?		be revivified and updated with reference to operating and maintenance procedures. New labels or modifications to existing components may be required.	All pipes are labeled, flow direction, etc. and all valves are tagged and referenced in the appropriate SOPs.	Complete
13	Is communications equipment adequate and easily accessible?	Yes	None	N/A	Complete
14	Are provisions made to allow others to know when a worker is incapacitated in the process area?	Yes, ammonia storage structure has land line to control room. Operators carry radios.	Land line operation to be tested periodically.	PM tests land lines and operators carry radios	Complete
15	Are special tools required to perform any tasks safely or efficiently?	Yes, they are available on site such as the ammonia storage tank ammonia vapor scrubber.	None	N/A	Complete
	Does the labeling program include components (e.g.,	Should be verified.	Labeling of system components needs to		

16	small valves) that are mentioned in procedures even if they are not assigned an equipment number?		be revivified and updated with reference to operating and maintenance procedures. New labels or modifications to existing components may be required.	Refer to item 12	Complete
17	Are plant instruments and controls clearly labeled?	Should be verified.	Consider setting up a quality control program to ensure instruments and controls are clearly labeled.	Instrumentation and controls are clearly labeled.	Complete
18	Are the labels accurate?	Existing labels are accurate.	None	N/A	Complete
19	Has responsibility been assigned for maintaining and updating the labels?	To be done.	Ensure that someone is assigned responsibility for maintaining and updating labels.	Responsible person has oversight of labels.	Complete
20	Are emergency exit and response signs clearly visible and easily understood?	Should be verified.	Will conduct survey and make modifications, if required.	Review was performed, signs have been reviewed and are clearly visible.	Complete

21	Is adequate information about normal and upset process conditions available in the control room?	Yes, in operating procedure manual.	None	N/A	Complete
22	Are critical alarms separated from control alarms?	Operators can differentiate aqueous ammonia critical alarms from control alarms.	All aqueous ammonia alarms are critical. Will investigate possible	New alarm system was installed, leak detectors and vapor detectors trigger alarm (audible).	Complete
23	Is an alarm summary available on display?	Yes	None	N/A	Complete
24	Are operators required to perform calculations when reading displays?	No	None	N/A	Complete
25	Do the displays give rapid feedback for all operational actions?	Yes, 2 to 15 seconds	None	N/A	Complete
26	Is the information displayed in ways the operators can understand?	Should be verified.	Ensure operators are provided with proper training.	Operators have been given the appropriate training	Complete
27	Are the operators provided with enough information to diagnose and upset when an alarm sounds?	Yes	None	N/A	Complete
28	Are the controls distinguishable and easy to use?	Yes	None	N/A	Complete

29	Have consequences of operator intervention in computer-controlled processes been considered?	Yes	None	N/A	Complete
30	Does the control logic seem adequate?	Yes	None	N/A	Complete
31	Is there a dedicated emergency shutdown panel?	Not on distributed control system but locally in the ammonia storage structure there is a shutdown panel.	None	N/A	Complete
32	Is a complete, current set of procedures for startup, shutdown, normal operations, and emergencies available for workers to use?	Yes	None	N/A	Complete
33	Are procedures written for the workers, considering their education, background, experience, native language, etc.?	Yes	None	N/A	Complete
34	Is a step-by-step format used for operating procedures?	Yes	None	N/A	Complete
	Are cautions and warnings	Should be verified.	Will conduct survey	System is labeled properly	

35	clearly stated in prominent locations before the potentially dangerous actions?		and make modifications, if required.		Complete
36	Are checklists used for critical procedures with only one action specified per numbered step?	Yes	None	N/A	Complete
37	Do steps requiring control actions also specify the	Should be verified.	Review emergency procedures.	Emergency procedures have been developed	Complete
38	Are the operators only in the control room?	No, operators physically check the system daily or more frequently.	None	N/A	Complete
39	Do the operators work in a variety of locations?	Yes	None	N/A	Complete
40	Has consideration been given to the number of manual adjustments a worker must perform during normal and emergency operations?	Should be verified.	Typically listed in operating procedures. Procedures consider minimum number of manual adjustments that have to be performed under normal and emergency conditions.	SOPs are adequate.	Complete
	Are assessments of job	Should be verified.	Ensure that	Daily inspections take place, and	

41	tasks performed routinely to distribute workloads?		assessments of job tasks performed routinely on aqueous ammonia system to distribute workloads are reviewed by operators.		operators have been trained.	Complete	
42	Has consideration been given to safety showers, tubs, and eyewash fountains, including freeze protection and temperature controls to prevent burning?	Yes	None		N/A	Complete	

#	Worksheet Report Checklist	Recommendations	Risk Rank	Node	Action Items	Document Reference	2010 PHA Revalidation Notes / Verification of	Status	Due Date
1	Truck hoses are disconnected or fail?	Inspection prior to use and proper work order. Place maintenance personnel on standby to support upset conditions	2	Delivery Truck Unloading System			Vendor policy to inspect truck prior to unload and delivery. SOPs	Complete	
2	Truck tank damage less than 100 gallons?	Explore moving the maintenance ammonia vapor scrubber	3	Delivery Truck Unloading System			Vapor scrubber has been removed	Complete	

3	Truck tank damage less than 100 gallons?	Update EL A-123 procedure and train operators on revised procedure	3	Delivery Truck Unloading System			SOPs have been revised and training has taken place	Complete	
4	Truck tank damage less than 100 gallons?	Explore addition If K-rails and bollards	3	Delivery Truck Unloading System			Road side of charging point has bollards installed. During unloading, area will be coned off.	Complete	
5	There is a power failure and a leak?	Need to tie in UPS	4	Aqueous ammonia storage tank			Uninterruptible power supply was evaluated and determined to be not cost effective. In addition, a power outage would trip the pumps, and no deliveries would be accepted.	Complete	
6	There is a leak and there is a power failure to the vapor detectors?	Explore UPS power source	2	Vapor Detectors			See item 5 above	Complete	
7	Pressure relief valve failed or overpressure	Evaluate preventative maintenance and inspection schedules of relief valves	4	Relief Valve			See 2.4 above. Relief vavles have been included into PM schedule.	Complete	
8	Pressure relief valve continuously vents	Evaluate preventative maintenance and inspection schedules of relief valves	4	Relief Valve			See 2.4 above. Relief vavles have been included into PM schedule.	Complete	
9	Tank imploded and line breaks	Evaluate preventative maintenance and inspection schedules of vacuum breaker	4	vacuum breaker			Vacuum breaker has been included into PM schedule	Complete	

10	Vacuum breaker fails	Evaluate preventative maintenance and inspection schedules of vacuum breaker	4	vacuum breaker			Vacuum breaker has been included into PM schedule	Complete	
11	There is a leak downstream of the 2" line flowmeters	Operational test to ensure alarm set points	2	Aqeous ammonia Piping			Double walled piping to prevent leaks. Removed flow meters for leak detectors	Complete	
12	There is a leak downstream of the 2" line flowmeters	Trip curcuit that would trip all the pumps if ther's inflow and outlow differential.	2	Aqeous ammonia Piping			Double walled piping to prevent leaks. Removed flow meters for leak detectors	Complete	
13	There is a leak downstream of the 2" line flowmeters	Explore proper instrumentation and controls	2	Aqeous ammonia Piping			Double walled piping to prevent leaks. Removed flow meters for leak detectors	Complete	
14	No water flow	Consider using main fire water system	2	Vapor Scrubber			Scrubber has been removed. SOP includes steps for using portable water.	Complete	

APPENDIX F

SEISMIC ASSESSMENT UPDATE FOR RISK MANAGEMENT PLAN
HALEY & ALDRICH, INC., SEPTEMBER 13, 2010

&

STRUCTURAL REVIEW OF COMPLETED AMMONIA PIPING SYSTEM SUPPORTS
MURASHIGE & ONISHI ENGINEERING, SEPTEMBER 12, 2011

Haley & Aldrich, Inc.
9040 Friars Road
Suite 220
San Diego, CA 92108-5860

Tel: 619.280.9210
Fax: 619.280.9415
HaleyAldrich.com

13 September 2010

File No. 37341-000

NRG El Segundo Operations, Inc.
301 Vista Del Mar
El Segundo, CA 90245

Attention: Alexander Sanchez, CSP
Safety & Environmental Supervisor

Subject: Seismic Assessment Update for Risk Management Plan
El Segundo Power Station, El Segundo, California

Dear Mr. Sanchez:

Haley & Aldrich, Inc. (Haley & Aldrich) has completed the walkthrough of Ammonium Hydroxide Storage and Handling System at the El Segundo Generating Station and reports the following conclusions for your consideration.

Purpose and Scope

The California Accidental Release Program (CalARP) requires facilities that are subject to the CalARP requirements to update and revalidate their process hazard analysis every five years.

Section 3 of the Guidance for CalARP Program Seismic Assessment, (Region 1 Local Emergency Planning Committee) September 2009, was used to perform the seismic assessment walkthrough.

The scope of the update was to perform a seismic assessment walkthrough of the Ammonia Hydroxide Storage and Handling System; review available documents describing significant changes to the system and supporting structures affecting seismic design of the system; and prepare this report on the seismic assessment.

Background

A CalARP seismic assessment of the Unit 4 Ammonia Hydroxide Storage and Handling System was prepared by Myers Houghton & Partners in 1999. As part of this seismic assessment a walkthrough of the ammonium hydroxide storage and handling component of the selective catalytic reduction (SCR) system was conducted. Four potential seismic failure modes were identified:

- Heavily corroded broken pipe clamps in the above ground system piping;
- Insufficient lateral bracing of pipe supports in the aboveground system piping;

- Excessive distance between hanger types, supports or lack of lateral restraint of system piping in Unit 4; and
- Corroded nuts on system piping flanges bolts.

A seismic assessment was conducted after the installation of the Unit 3 vaporizer skid to determine if there were any seismic related deficiencies. A reassessment of Unit 4 was completed to ensure that all the above identified deficiencies had been corrected. This assessment was conducted in August 2001. It was confirmed during this assessment that all deficiencies previously noted in Unit 4 were corrected.

On April 16, and June 13, 2004, updated seismic walkthroughs were conducted by Shaw Environmental, Inc. (report entitled *CalARP Program Seismic Assessment, Ammonia Hydroxide Storage and Handling System; El Segundo Generating Station,* dated June 18, 2004). The walkthrough included the seismic evaluation of the Ammonia Hydroxide Storage and Handling System as described in Section 2.1 of the CalARP Program Assessment (Region 1 Local Planning Emergency Planning Committee), January, 2004. The engineer verified that all findings identified during the April 16, 2004 assessment had been addressed adequately.

As required by CalARP, on August 18, 2010, an updated seismic walkthrough was conducted by a California professionally licensed structural engineer. The walkthrough included the evaluation of the Ammonia Hydroxide Storage and Handling System.

Summary Seismic Walkthrough

Please see the attached structural engineer's report for a discussion of the walkthrough and conclusions drawn by the structural engineer.

Seismic Hazard Evaluation

Section 1.4 of the Guidance for CalARP Program Seismic Assessment, for facilities with a previous CalARP seismic assessment, indicates that a revalidation of the seismic assessment may rely on previous CalARP assessment reports, provided that the report satisfies the reporting requirements of Section 9 of the guidelines.

The structural engineer has reviewed the guidelines and 2004 Shaw Environmental report and was unable to conclude that the data from the previous seismic study was valid and current. Specifically, the engineer could not verify that:

- Site condition including geotechnical characteristics of the site did not change since the last evaluation and that there were no major changes to cause the groundwater level to be significantly different from the previous assessment;
- Ground motion measurements in terms of quantitative and qualitative measure are unchanged from the previous assessment; and,

- Historic seismicity, ground rupture potential, liquefaction and seismic settlement, landslide potential and tsunami and seiche are unchanged in light of current southwest seismic activity.

Recommendations

Haley & Aldrich has reviewed the structural engineer's report and it is recommended that the following tasks be performed to complete the seismic revalidation:

1. Update the previous seismic hazard report by a qualified licensed geotechnical engineer.
2. A licensed structural engineer should calculate support spacing requirements (gravity and lateral) based on current code requirements. The structural engineer will need NRG to provide existing piping layout drawings with existing support locations.
3. Identify the location for possible new support locations and identify existing supports to remain.
4. A licensed structural engineer should provide construction documents with drawings and specific support details.
5. NRG should implement corrective actions in accordance with the construction documents, including removal of aged and corroded supports and construction of new supports.
6. After completion of implementation of the above work, a licensed structural engineer should perform a final site walk and issue a final revalidation report regarding compliance of the ammonia hydroxide system with the current code.

We appreciate the opportunity to submit this report. Please contact the undersigned if you wish to discuss our recommendations or any aspect of the project.

Sincerely yours,
HALEY & ALDRICH, INC.

Benjamin R. Chandler
Vice President

Scott Boston, CIH, CSP, CPEA
Senior EHS Management Specialist

Enclosures:

1. Simon Wong Engineering Report, dated 1 September 2010

September 1, 2010

Mr. Ben Chandler
Vice President
Haley & Aldrich
9040 Friars Road, Suite 220
San Diego, CA 92108

Re: Structural Site Visit and Observation Report for the Structural and Seismic Bracing Support of the Ammonia Piping System at El Segundo Power Station, El Segundo, CA
SWE Job #195-08

Dear Mr. Chandler:

Pursuant to your request, we have conducted a site visit for the Ammonia Piping System at El Segundo Power Station, El Segundo, CA. The site visit was conducted on August 18, 2010 and attended by Zeenat Chandrasekhar of Simon Wong Engineering, Scott A. Boston of Haley & Aldrich, and Alex Sanchez of NRG Energy Inc. The purpose of our visit was to visually observe, photograph, and document the seismic supports and their condition along the entire ammonia system from the equipment compound to the power plant injection pad. Photographs are attached in Appendix A and the site plan in Appendix B. The following summarizes our structural observations and findings.

Background and Structural System

Aqueous ammonia is delivered by trucks to the El Segundo Generating Station (ESGS) in trucks and stored in a single underground aqueous ammonia storage tank. The aqueous ammonia is pumped from the storage tank through a single 2-inch (appears larger than 2" however stated as 2" in the earlier report) stainless pipe to the aqueous ammonia vaporizer skids. The piping, near the aqueous supply pumps, is located above ground and runs along a steep hill going north and then dives below ground going towards the west and re-emerges above the ground west of the road. The piping goes further west down a steep hill and turns north towards the main plant building, where it goes below the ground again to resurface adjacent to the building. The piping splits into three major runs, one all the way to the back of the building to SCR unit #3, second to SCR unit #4 and the third to the chemical treatment unit.

At the site visit, a 2004 CALARP Program Seismic Assessment Report for the "Ammonia Hydroxide Storage and Handling System" at ESGS prepared by Shaw Environmental, Inc. was presented, which commented on a prior 1999 report in which various improvements were recommended. The 2004 report indicated compliance with the required improvements recommended in the 1999 report; however, it is not clear that such improvements are still in compliance with the current code and that such improvements had sustained corrosion. Our site visit addresses conformance only to the current code.

Structural Observation and Recommendations

The following is a brief description of elements observed, deficiencies and recommendations during our August 18, 2010 site visit.

Piping Run from the Supply Pumps to the Main Building:

1) The underground tank was not observed.
2) Piping from the supply pumps is supported between bolted flanges and vertical unistruts. The unistrut clamps show signs of corrosion. The pipe is also supported overhead and the beam welds shows signs of corrosion. Some pipe clamps were missing thus compromising the vertical and lateral stability of the pipes.
3) Outside the storage tank enclosure the pipe is supported on unistruts that are welded to existing pipe run supports that are in various states of corrosion ranging from mild to severe. The unistrut columns are embedded in concrete base. Some columns showed severe corrosion, thus compromising the vertical and lateral stability of the ammonia pipe. At some locations the pipe clamps were missing.
4) The underground portion of the piping below the road was not observed. The NRG representative confirmed that the pipe was running in a double encasement below the ground. At the west side of the road where the pipe daylights the soil was excessively wet due to landscape water leaks. Direct corrosion was not observed as pipe was encased.
5) The west and north run of the pipe was also supported on miscellaneous unistrut/steel assemblies, an amalgam of existing old and recent connections in various states of corrosion. The main supports were severely corroded, clamps were missing and concrete bases were cracked in some cases. Lateral braces were added in some cases at 40' on center. However they were also not consistently provided.
6) The north run of pipe below the road was not observed.
7) The 2"-3" diameter stainless pipe run inside the building to SCR unit #3 was followed through the building to the vaporizer skid. The pipes were supported by overhead pipe hangers, steel wall brackets.
   Several gravity/lateral supports were missing or highly corroded.
8) The 2"-3" stainless steel pipe run inside the building to SCR unit #4 is shorter but unsupported pipe runs as long as 32' were observed.
9) The third ¾" to 1" pipe run that crosses into the adjacent building was observed to the chemical treatment. The pipe was supported by wall brackets. The unsupported pipe runs were very long at some locations about 14-20' and averaging 10'. Clamps were found missing at a few locations. Bracket attachments to wall showed anchors not fully embedded in the wall.

Seismic Hazard Evaluation:

The Seismic Hazard evaluation of the previous risk assessment studies were based on the earlier geotechnical report as referenced in Appendix C.1 of the 2004, Shaw Environmental Report.

The codes have been significantly revised since then and we strongly recommend a new Seismic Hazard Evaluation be prepared based on current codes and updated seismicity information.

Conclusions:

The Ammonia Pipe Supply line does not meet the current seismic code criteria due to the following reasons:

1) Heavily corroded, missing pipe clamps, spring nuts, vertical unistruts, and old mixed metal connections.
2) Insufficient lateral bracing due to lack of insufficient gravity supports.

3) Missing and corroded overhead piping supports in the building to unit #3 and #4 and chemical treatment.

Recommendations:

1) A complete seismic analysis of the ammonia support system that complies with the CBC 2010 and ASCE 7-05.
2) Provide vertical and lateral supports that meet the code strength and serviceability criteria.
3) Remove and replace all damaged, severely corroded and non-compliant supports.
4) Check existing apparent rust free supports for code compliance if no evidence of earlier code compliance available.
5) Avoid connecting to old corroded dissimilar existing metal supports.

References:

1) CALARP Program Seismic Assessment for the "Ammonia Hydroxide Storage and Handling System" at ESGS prepared by Shaw Environmental, Inc. dated June 18, 2004.
2) The following drawings were provided following the site visit:
   a. SCR Aqueous Ammonia Storage Facility General Arrangement Switchyard Area (5237731-J Dated 11/10/1993 Revision 1.)
   b. Pipe Support Modification and Plan Details (5266383-O, 5266384-O Dated 07/23/1999 Revision 0)

The above references were used only to acquire general concept of the Ammonia piping layout and condition of the piping support in 2004. This report is not a revalidation of the 2004 Seismic Assessment Study by Shaw Inc.

Please call us should you have any questions.

Sincerely,

SIMON WONG ENGINEERING

Simon Wong, S.E.
President

Attachments:

Appendix A: Photos
Appendix B: Site Plan per previous Seismic Assessment Report

APPENDIX A

SITE PHOTOGRAPHS

(AVAILABLE UPON REQUEST)

APPENDIX B

SITE PLAN

(AVAILABLE UPON REQUEST)

MURASHIGE & ONISHI
ENGINEERING CO., INC.
Structural Engineers
5800 HANNUM AVENUE, SUITE A220
CULVER CITY, CALIFORNIA 90230
VOICE: (310) 568-0100 FAX: (310) 568-0111
E-MAIL: bob@onishiengineering.com

Residential-Commercial-Industrial Established
1970

12 September 2011

Mr. Roman Aguilar, Maintenance Coordinator
NRG EL SEGUNDO OPERATIONS INC.
301 Vista Del Mar Blvd.
El Segundo, CA 90245

RE: NRG El Segundo Operations Inc., located at 301 Vista Del Mar Blvd., El Segundo, California. Structural review of completed ammonia piping system supports.

Dear Mr. Aguilar:

At your request, this office visited the above mentioned facility on August 23, 2011. Our visit was conducted in the presence of the General Contractor (Performance Mechanical, Inc.) and yourself. The purpose of our visit was to review completed remedial work on the overhead ammonia piping system supports for Units 3 and 4.

Remedial work performed by the Contractor was based on our original report dated January 10, 2011 and our supplemental report dated March 18, 2011. Recommendations prescribed by this office to enhance and/or repair the existing piping supports were developed taking into consideration "gravity" and "seismic" loading on the support elements according to current Municipal Code requirements. NRG has chosen to phase the required remedial work into two categories: 1) support elements requiring immediate repairs and 2) support elements not requiring immediate repairs. Elements not requiring immediate repairs were supports where the Engineer required removal of surface rust and recoating with a weather-resistant paint coating. recoating Our March 18th report enumerated the support elements that required immediate repairs or upgrading.

Based upon our review of the completed remedial work on the 3 ammonia lines, it is our professional opinion that the "1st priority repair work items" narrated in attached plates A1, B1 and C1 has been completed.

The information provided in this report is expressed as an opinion, based on obtainable information to date. The availability of new information could result in this office to amend its opinions and recommendations.

If you have any questions regarding statements made in this report, please feel free to contact this office.

Respectfully submitted,

Robert K. Onishi, S.E.

Attachments: Plates A1, B1 & C1

MURASHIGE & ONISHI
ENGINEERING CO., INC.
Structural Engineers
5800 HANNUM AVENUE, SUITE A220
CULVER CITY, CALIFORNIA 90230
VOICE: (310) 568-0100 FAX: (310) 568-0111
E-MAIL: bob@onishiengineering.com

10 January 2011 ***(revised July 15, 2011)***

NRG EL SEGUNDO ***(1st priority repair work items)***

PLATE A1
1" Diameter Ammonia Line Support Requirements

2. Add new support (per detail "1")
3. Add new support (per detail "1")
4. Add new hanger support (per detail "2"or "3")
5. Add new hanger support WF beam above (per detail "2" or "3")
6. Add new hanger support WF beam above (per detail "2" or "3")
10. Add extra support at lower horizontal section of piping within 2 feet of where vertical section of pipe comes down (per detail "7")
13. Provide angle iron anchored to CMU wall above door.
14. Replace steel angle L bracket (per detail "7" or "9")
15. Add new bracket support (per detail "7"or "9")
16. Replace "cut" L bracket with new support (per detail "7")
18. Add new bracket support (per detail "7"or "9")
20. Provide new support bracket (per detail "7" or "9")
21. Replace steel angle L bracket with new support (per detail "7"or "9")
23. Provide new support bracket (per detail "8")
24. Provide new support bracket (per detail "8")
25. Add new bracket support (per detail "7"or "9")
27. Provide new support bracket (per detail "9")
29. Replace support bracket (per detail "9")
31. Replace support bracket (per detail "9")
33. Add angle iron to Steel Angle above (per detail "2" or "3")
36. Add angle iron to Steel Angle above (per detail "2" or "3")
41. Add steel angle to stabilize piping (per detail "10")

Note: 1) 1-1/2"sq. x 7 Ga. steel tubing may be used in lieu of L 2-1/2"x 2-1/2"x ¼" angle iron called out on details.

2) At details "7" and "9" if masonry wall is not grouted, provide ½" dia bolts w/ 2"sq. x ¼" plate on back side of wall.

MURASHIGE & ONISHI
ENGINEERING CO., INC.
Structural Engineers
5800 HANNUM AVENUE, SUITE A220
CULVER CITY, CALIFORNIA 90230
VOICE: (310) 568-0100 FAX: (310) 568-0111
E-MAIL: bob@onishiengineering.com

10 January 2011 ***(Revised July 15, 2011)***

NRG EL SEGUNDO ***(1st priority repair work items)***

PLATE B1
2" Diameter Ammonia Line Support Requirements (Unit 3)

4. Add new brace to WF beam above (per detail "1")
5. Add new brace to WF beam above (per detail "1")
9. Replace rusted unistrut "cradle" with new support (per detail "1")
10. Provide new L bracket (per detail "1")
11. Provide clamp between piping and existing WF beam
14. Provide clamp between piping and existing WF beam
18. Provide clamp between piping and existing WF beam
30. Add new support bracket (per detail "7")
31. Replace rusted bracket (per detail "7")
32. Replace rusted bracket (per detail "7")
34. Add new support bracket (per detail "7")
43. Provide a supplemental steel angle hanger (per detail "2")
45. Provide a new steel angle welded to WF beam (per detail "11")
46. Replace unistrut outrigger (plate 11) with new steel angle support (per detail "10")

Note: 1) 1-1/2"sq. x 7 Ga. steel tubing may be used in lieu of L 2-1/2"x 2-1/2"x ¼" angle iron called out on details.

2) At details "7" and "9" if masonry wall is not grouted, provide ½" dia bolts w/ 2"sq. x ¼" plate on back side of wall.

MURASHIGE & ONISHI
ENGINEERING CO., INC.
Structural Engineers
5800 HANNUM AVENUE, SUITE A220
CULVER CITY, CALIFORNIA 90230
VOICE: (310) 568-0100 FAX: (310) 568-0111
E-MAIL: bob@onishiengineering.com

10 January 2011 ***(Revised July 15, 2011)***

NRG EL SEGUNDO ***(1st priority repair work items)***

PLATE C1
2" Diameter Ammonia Line Support Requirements (Unit 4)

2. Add cross member at catwalk beams and within 12" of elbow(per detail "1")
4. Add unistrut / angle support to (E) member to create L support.
5. Add hanger support to beam (detail "1")
7. Add cross member (double angle) from (E) column to (E) catwalk beam and drop angle iron piece to support pipe (per detail "3")
8. Add cross member (double angle) from (E) column to (E) catwalk beam and drop angle iron piece to support pipe (per detail "3")
9. Add stanchion to support piping at elbow (detail "6")

Note: 1) 1-1/2"sq. x 7 Ga. steel tubing may be used in lieu of L 2-1/2"x 2-1/2"x ¼" angle iron called out on details.

2) At details "7" and "9" if masonry wall is not grouted, provide ½" dia bolts w/ 2" sq. x ¼" plate on back side of wall.

APPENDIX G: EQUIPMENT DESCRIPTION AND SPECIFICATIONS SUMMARY

APPENDIX G: EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS	
Underground Storage Tank (29.4% NH_4OH)	
Manufacturer:	Joor Manufacturing, Inc. (Serial No. 5285)
Reference:	Drawings 468247-3 (P&ID SCR Ammonia Storage); 5235705-1 (Ammonia Storage Tank Piping Plan and Sections); 5237796-1 (Ammonia Storage Tank Foundation); Instruction Book for Care & Operation of SCR Systems, SCE Units 3 & 4, Babcock & Wilcox (4 Volumes)
Type/Design:	Interior tank (10'D x 32'-3"L) to ASME Unfired Pressure Vessel Code Section VIII, Division 1 (1989), Carbon Steel, SA516, Grade 70. Exterior tank (10'-2"D x 37'-10"L) to UL58/1746 with exterior plasteel fiberglass
Installation Date:	12/1993
Capacity:	20,000-gallon, 50 psig, 150°F
Relief Valve:	Farris Model 26LA10-120 meets ASME Pressure Vessel Code, Section VIII, with release set point of 50 psig (installed 2010). Any liquid ejected will be contained by the closed, dead end drain pipe with a liquid leak sensor at the bottom. Any vapor ejected will vent into the 6-inch vent line.
Flame Arrestor:	ANSI B31.1 Class N vent piping with Varec 54003A22SS 2" Flame Arrestor (installed 2010)
Vacuum Breaker:	3" carbon steel piping with Protectoseal Model 17802D3 Pipe-Away Pressure Conservation Vent (installed 2010) set at 3/4 oz/in^2 (~0.05 psig)
Vapor Return:	2" camlock quick disconnect; 2" Class S piping with hand valve
Fill Line:	2" camlock quick disconnect; 2" Class S piping with hand valve at tank
Level and Temp:	Magtech float level gauge and MTS Level Plus level and temperature transmitter to Allied Control panel set at high level of 10' and low 4'.
Shut-Off Valves:	Manual hand valves on connections to tank and instruments (except for level)
Grounding:	Grounding lugs on UST and pumps
Leak Detection:	See Monitoring section below
Supply Pumps:	3 *(flow to pipelines to be controlled by DCS)*
Reference:	Instructions for Care and Operation of Babcock & Wilcox Equipment for ESGS Units 3 &4, Instruction Book for Care & Operation of SCR Systems, SCE Units 3 & 4, Babcock & Wilcox
Type:	Stainless steel, seal-less magnetic drive pumps
Controller:	Each pump has an integral controller which receives a signal from a pressure transmitter on its discharge piping that modifies the adjustable speed drive to maintain supply pressure. Low pressure (40 psig) activates backup pump. High pressure (85 psig) trips the supply pumps.
Capacity:	0 – 7 gpm, 75 psi
Pressure Relief:	Relief valve (LiquidFlo) on each pump discharge pipe set to open at 85 psig into the return line back to the UST.
Pump Controls:	Manual and automatic controls in Control Room (no local controls) with pump trip, pump run, pump discharge pressure and low pressure alarm.
Pump Trips:	Activated by the NH_4OH tank level alarm, tank or piping liquid detection alarm; pumps on and no NH_4OH flow to either SCR Skid.

NH_4OH Deliveries: Source - Airgas Aqua Ammonia Technical Data Manual and Airgas Training & Required Certification

- Specification: Trucks are DOT specification MC- 307 or DOT-407 cargo tank motor vehicles
- Capacity: 6,000 gallons (Standard Delivery) / Size: 42'long x 8'wide x 13' height, Turning circle: 180 feet
- Hose: 2-inch x 20-foot EPDM rubber hoses with stainless steel cam and groove fittings
- Unloading Pump: Onboard, centrifugal pump with a maximum capacity of 150 gpm.
- Pressure Relief: Pressure relief valve set to DOT requirements and replaced every 5 years.
- Compressed Air: Onboard compressed air to purge lines before disconnection.
- Maintenance: Inspected prior to each dispatch and daily to ensure hoses and fittings are in proper condition.
- Preventative maintenance is done on a regularly scheduled basis.

APPENDIX G: EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS	
Units 3 & 4 Pipeline (aboveground)	
Reference:	Instructions for Care and Operation of Babcock & Wilcox Equipment for ESGS Units 3 &4; Instruction Book for Care & Operation of SCR Systems, SCE Units 3 & 4
Design:	Service Piping: ANSI B31.1, 2" Class S, 316L Stainless Steel, ANSI 150#, 110°F, 150 psig, welded
Containment:	Main pipeline from UST to power block (except underground): George Fisher 4" clear PVC pipe partially wrapped with sheet metal (annular space visible from bottom)
Pressure Relief:	Relief valve (LiquidFlo) on each supply pump discharge pipe set to open at 85 psig. If open, valve will discharge into the tank return line and recycle the liquid back to UST.
Shut-Off:	Control Room shut-down of supply pumps + manual ball valve on tie-in to main header within the containment area above the UST.
Leak Detection:	See Leak Detection Monitoring section below.
Units 3 & 4 Pipeline (underground)	
Reference:	Instructions for Care and Operation of Babcock & Wilcox Equipment for Units 3 &4; Instruction Book for Care & Operation of SCR Systems, SCE Units 3 & 4, Babcock & Wilcox (4 Volumes)
Design:	ANSI B31.1, 2" Class S, 316L Stainless Steel, ANSI 150#, 110°F, 150 psig, socket weld
Containment:	4" Carbon Steel SCH 40 with exterior corrosion-resistant coating
Leak Detection:	See Leak Detection Monitoring section below.
Units 3 & 4 SCR Skids (29.4% NH_4OH)	
Manufacturer:	Babcock & Wilcox
Description:	Single-pass, atomization evaporator with two sets of three spray nozzles; manifold valve stations; motor control center; leak detector panel; and UPS
Reference:	Drawings 5238449-1 (SCR Skid P&ID Unit 3), 5238449-2 (SCR Skid P&ID Unit 4), NR02-102 (SCR Unit 4 General Arrangement) in the Operation & Maintenance Manual for Unit 4 SCR (DNX Engineers, 5/09/07); Instructions for Care and Operation of Babcock & Wilcox Equipment for ESGS Units 3 &4; Instruction Book for Care & Operation of SCR Systems, SCE Units 3 & 4, Babcock & Wilcox
Vaporizer Limits:	Temperature indicator set points for the ammonia/air mixture within the vaporizer is set at a low of 150°F and the mixture ration is set at 12% NH_3 by volume to keep the mixture below the flammability limit (16 – 27% NH_3 in air). Either set point triggers the ammonia supply shut-off valve to close.
Pressure:	70 psig NH_4OH supply at vaporizer; flow controlled by the ammonia flow control valve (FCV 7856)
Instruments:	Pressure and temperature gauges upstream of each vaporizer
Relief Valves:	Piping pressure control valve upstream of each vaporizer set at 40 psig
Check Valve:	Located in the NH_4OH supply line upstream of the vaporizer
NH_4OH Shut-Off:	Manual Valve (HV 7855) + Emergency Stop Button on Control Panel + Pneumatic solenoid valve shut-off if vapor leak (50 ppm), high ammonia in vaporizer (8%), ammonia strainer differential pressure high (5 psig), UPS failure or power outage trip, or all 3 NH_4OH supply pumps fail
Leak Detection:	See Monitoring section below
Units 3 Chemical Feed Station (29.4% NH_4OH)	
Reference:	Drawing 5218571-1 P&ID of Chemical Feed Station; Units 3 &4,System Description R
Description:	Metering cylinder, mix tanks and piping within concrete secondary containment curb. The unit is operated manually by an operator by holding open the dead-man valve to fill the transparent acrylic metering cylinder. The NH_4OH allotment is then gravity flows the into either the dilution water in the Unit 3 or Unit 4 mix tank. The resulting mixture from the mix tank is then pumped into the suction boiler feed pump and/or discharge condensate pump. The flow is automatically controlled by conductivity transmitter which provides primary stroke control for the pumps.
Vessels:	1/2 gallon, Transparent Metering Cylinder, acrylic, atmospheric (installed 2011) + two 50 gallon, atmospheric, stainless steel tanks, each with a sight level glass and a common circulating pump.
Overflow:	Dead-man valve on the transparent metering cylinder + sight glass on the mix tank filled manually.
Monitoring:	Local Chemical Feed Board panel with pump controls and low level alarms
Check Valve:	1 between mix tank and ammonia pump

APPENDIX G: EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS	
Leak Detection Monitoring, Units 3 & 4	
Reference:	Instruction Book for Care & Operation of SCR Systems, SCE Units 3 & 4, Babcock & Wilcox.
The Distributed Control System (DCS) that is continuously monitored by the Control Room monitors the following: • Tank Level – liquid level indication with high and low level alarm. High level alarm set at 90% tank capacity; Low level alarm will also trip the supply pumps • Tank Temperature – Transmitter to Allied Control panel set at low of 60°F and high of 75°F • Leak Detection - Three control panels: 1. Pneumercator Inc. In-Tank Gauging and Secondary Containment Leak Monitor (Model TMS-3000) monitors at the tank monitors two leak detection systems: • Tank liquid leak sensors (6 x Model E825-100XF): 1 at each end of the tank between the walls; 1 pressure relief valve (Hi Reservoir); 1 in each of the three supply pump housings (sumps). Activation or UPS malfunction or power outage trips tank supply pumps. Area vapor detectors (3) located approximately 8 feet above the tank. • Pipeline liquid leak sensors (11 x Model E825-100XF): Monitors annual space between primary and secondary containment piping from tank to power block riser. Activation or UPS malfunction or power outage trips tank supply pumps. • Vapor detectors located approximately 8 feet above each end and the middle of the tank, set to alarm at 20 ppm to local panel and Control Room. 2. Sierra Monitoring Panel (Model 5000) at each SCR Skid that monitor 8 vapor detectors (Model 4101-25) located along the supply pipeline inside the power block (16 total), set to alarm at 20 ppm to local panel and Control Room.	
Units 5 & 7 Pipeline (aboveground)	
Reference:	USA659-XW01-00U-310001; USA659-XW01-00U-300057
Design:	1” service pipe, Class 150, to ASME B31.1-2009, ASTM A312 TP316L, SCH. 40S, ASME B36.19, welded, fittings to ASME B16.9 or B16.11, flanges to ASME B16.5, gaskets to ASME B16.21 and PTFE or equivalent, bolts to ASME B18.2.1. Containment piping, SCH. 40, A53 GRB welded carbon steel with exterior epoxy coating. Containment piping insulation: 1.5” thick Polyurethane foam with FRP protective jacket.
Pressure Relief:	Relief valve (LiquidFlo) on each UST supply pump discharge piping set to open at 85 psig.
Shut-Off:	Control Room shut-down of supply pumps + manual ball valve (AA001) on tie-in to main header within UST containment area.
Leak Detection:	See Leak Detection Monitoring section below.
Units 5 & 7 Pipeline (underground)	
Manufacturer:	Perma Pipe, Inc., Ultra-HT, pre-engineered double-pipe containment system with integral continuous leak detection and location system.
Reference:	USA659-XS00-00HSJ-310016; USA659-XG02-HSJ00-4181-1; USA659-XW01-00U-310001; USA659-XW01-00U-300052 and D5040-12-68-BO; USA659-XJ00-10HSJ30-530001
Design:	Same as Units 5 & 7 Pipeline (aboveground) Containment piping consists of 4” Ameron International Bondstrand 3000A FRP with exterior 1.5” thick polyurethane foam with exterior FRP protective jacket.
Vent & Relief:	Class N, Carbon Steel, ANSI 150#, 100°F, atm pressure
Pressure Relief:	Relief valve (LiquidFlo) on each supply pump discharge pipe set to open at 85 psig. If open, valve will discharge into the tank return line and recycle the liquid back to UST. Containment pipe fitted with 3/4" vent and check valve and 3/4" drain tube.
Drain:	Containment piping designed to drain to low point containing a liquid leak detector.
Leak Detection:	See Leak Detection Monitoring section below.

APPENDIX G: EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS	
Units 5 & 7 SCR Skids (29.4% NH_4OH)	
Reference:	TWAL-0201-SP05, 21019-105-9; Siemens Balance of Plan Familiarization Training Manual
Description:	Single-pass, atomization evaporator with two sets of three spray nozzles; manifold valve stations; motor control center; leak detector panel; and UPS
Design:	Piping to ASME B31.1, 1/2" TP316L stainless steel, welded, seamless, Sch. 40S. ASME B16.X fittings and flanges.
Vaporizer Limits:	Temperature indicator set points for the ammonia/air mixture within the vaporizer is set at 150°F (low) + mixture ratio set at 12% NH_3 by volume to keep the mixture below the flammability limit (16 – 27% NH_3 in air). Either set point triggers the SCR Skid NH_4OH supply solenoid valve (AA005) to close.
NH_4OH Pressure:	Pressure transmitter (CP001) set to alarm at Control Room DCS at 100 psig. (high) and 50 psig (low) + 30 psig (low-low) auto-close SCR Skid NH_4OH supply solenoid valve (AA005).
NH_4OH Flow:	Fail-shut flow control valve (AA101) and flow transmitter (CF001) monitors the supply line flow as needed based on real-time calculated need set by NOx Controller. Flow rate is displayed on DCS.
SCR Gas Temp:	Mixer outlet temperature transmitter to auto-close SCR Skid NH_4OH supply solenoid (AA005) at 420°F.
Dilution Gas Flow:	Flow meter (CF901) set at 1,500 SCFM to auto-close SCR Skid solenoid valve (AA005).
AIG Gas Temp:	Temperature transmitter (CT901) at Ammonia Injection Grid inlet set to alarm at DCS at low of 560°F and high of 750°F + auto-close SCR Skid NH_4OH supply solenoid valve (AA005) at 550°F.
Ammonia Slip:	Ammonia analyzer in the exhaust stack indicates ammonia concentration in the exhaust.
Instruments:	Pressure (CP502) and temperature gauge (G101C) upstream of each vaporizer
NH_4OH Shut-Off:	UST supply valve (AA001) + Emergency Stop Button on Control Panel + auto-close SCR Skid NH_4OH supply solenoid (AA005) valve if low NH_4OH supply pressure; low dilution gas flow; low SCR gas temperature; low inlet flue gas temperature at AIG, turbine shut down.
Ammonia Dosing Skids (19% NH_4OH)	
Reference:	D-FC0166-M01; D-FC0166-M011; D-FC0166-M21A, -M21B, -M21C
Description:	Ammonia Dosing Skid of welded steel channel frame (epoxy coated) with 440-gallon, diamond plate secondary containment. Skid located inside 20' shipping container with insulation and exhaust fan. Skid contains a 65 gallon NH_4OH container, piping manifold and metering pumps and control panel.
Design:	ASME B31.1, 304SS, seamless piping, tubing, fittings and valves, pressure gauge, + 36 cu. inch pulsation dampener + 1.5” clear PVC graduated standpipe.
Vessels:	65 gallon container
Level Control:	Low level switch with set point at 2” above tank bottom.
Connections:	Container connected by 304SS flexible braided hose to Ammonia Dosing Skid piping manifold + vent line to activated carbon filter.
Pumps:	Variable speed, positive displacement, piston diaphragm pumps (1.7 gph at 150 psig.) equipped with double suction and discharge check valves and an internal PRV set at 200 psig.
Pressure:	Pressure gauge (CP501) downstream of Ammonia Metering Pumps (siphon) monitors piping pressure.
Leak Detection Monitoring, Units 5 & 7 Pipeline	
The Distributed Control System (DCS) in the Control Room continuously monitors the Perm-Alert PAL-AT Leak Detection and Location System consisting of an Alarm Panel that continuously monitors: o A cable type leak/location sensor within the interstitial space capable of detecting all liquids or if there is a break or short in the leak detection cable. o Liquid sensor located in the piping low point that will identify any liquid leakage that has settled to the low point in the system. Activation will alarm locally at the Alarm Panel and the Control Room DCS.	

APPENDIX H: PIPELINE LENGTH AND CALCULATED CAPACITY

CALCULATION OF PIPELINE CAPACITIES[1], [2]						
Pipe Segment	**Diameter [3]** (inches)	**Linear Feet**	**Inches**	**Volume[4]** (in^3)	**Volume** (ft^3)	**Gallons[5]**
Units 3 & 4 Pipeline						
A/G UST area to Unit 4 Riser (with containment pipe)	2	875.00	10500.00	35336.17	20.45	152.97
A/G Unit 4 Riser to SCR Skids	2	425.00	5100.00	17163.28	9.93	74.30
A/G Unit 4 to Unit 3 Chemical Feed Station	0.75	335.00	4020.00	2122.97	1.23	9.19
U/G below Site Access Road	2	95.00	1140.00	3836.50	2.22	16.61
U/G below Unit 4 Access Road	2	135.00	1620.00	5451.87	3.16	23.60
Total:		**1865.00**	**22380.00**	**63910.79**	**36.99**	**276.67**
Units 5 & 7 Pipeline						
A/G UST area to Power Block 10 Riser	1	2026.39	24316.65	21055.80	12.19	91.14
U/G from Power Block 20 Riser to Unit 7 SCR Skid	1	415.72	4988.63	4319.65	2.50	18.70
U/G from Power Block 10 Riser to Unit 5 SCR Skid	1	316.28	3795.36	3286.41	1.90	14.23
Total:		**2758.39**	**33100.63**	**28661.86**	**16.59**	**124.07**

Table Notes:

Abbreviations: A/G = aboveground; U/G = underground; in^3 = cubic inches; ft^3 = cubic feet; lbs. = pounds

(1) Units 3 & 4 Pipeline linear feet estimated based on field measurements

(2) Units 5 & 7 Pipeline linear feet from drawings USA659-XJ00-00HSJ30-530001, USA659-XJ00-10HSJ30-530001, and USA659-XJ00-20HSJ30-530001.

(3) Assumed internal diameter (ID): 1 inch pipe = 1.05 inch ID; 2 inch pipe = 2.07 inch ID; 3/4 inch pipe = 0.82 inch ID

(4) Volume = Pi x (Pipe I.D./2)^2 x Inches of Pipe

(5) Gallons = 7.4805 x Volume (cubic feet)

MBC

11 February 2014

George Piantka
NRG Energy West
5790 Fleet Street
Suite 200
Carlsbad, CA 92008
(760) 710-2156

Closeout Report
El Segundo Energy Center, Designated Biologist

Dear Mr. Piantka:

The following is a summary of activities conducted in 2011-2012 as part of Condition of Certification BIO-7 for the El Segundo Energy Center Project:

April 2011 – July 2011

Biologists conducted surveys during the Units 1&2 intake forebay modifications. No special-status species were affected by the operations.

May 2011 and July 2011

Nesting bird and vegetation surveys were conducted in and adjacent to proposed construction areas. No nesting birds were observed, and no special-status vegetation, birds, or wildlife were observed.

September 2011 – January 2012

Biological surveys of construction areas were conducted. The only special-status species observed was seacliff buckwheat, which was observed in two small patches on the dunes outside of the construction zone. However, biologists marked the buckwheat patches and provided training materials to construction crews to assist in protecting the isolated patches. The flagged patches were successfully preserved.

October 2012

Biologists conducted surveys within the plant along a proposed ammonia line corridor. No special-status plant, bird, or animal species was observed within the construction area. No nesting birds were observed.

Summary

The biological surveys conducted as part of Condition of Certification BIO-7 did not identify any impacts to special-status plant species, animal species, or plant species. Efforts to protect seacliff buckwheat on the dunes seaward of the El Segundo Generating Station were successful.

Respectfully,

MBC *Applied Environmental Sciences*

Shane Beck
Principal Scientist / Designated Biologist

11 February 2014

George Piantka
NRG Energy West
5790 Fleet Street
Suite 200
Carlsbad, CA 92008
(760) 710-2156

Closeout Report
El Segundo Energy Center, Designated Biologist

Dear Mr. Piantka:

The following is a summary of activities conducted in 2013 as part of Condition of Certification BIO-7 for the El Segundo Energy Center Project:

On 25 June 2013, MBC biologists Shane Beck and David Vilas conducted a survey of the area adjacent to (and outside of) the southern fenceline at the ESGS at the terminus of 45th Street. The vegetation in this area was proposed to be removed. The purpose of the survey was to determine if there were any sensitive biological resources (special-status plants or animals, or any nesting birds) within the construction area. The construction area is depicted in Figure 1.

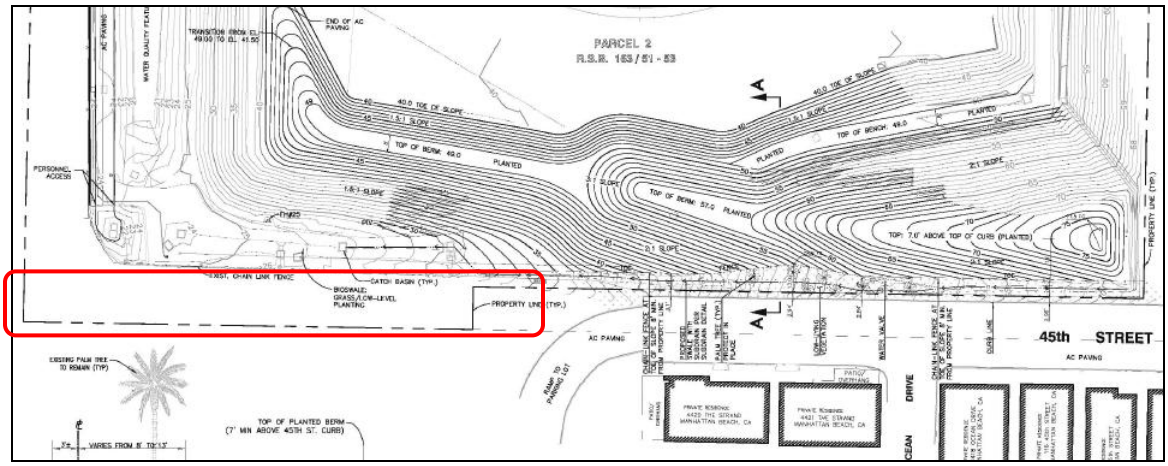


Figure 1. Location of biological survey conducted by MBC biologists on 25 June 2013.

All of the living plant species were documented previously within the El Segundo Generating Station property line (see MBC Nesting Bird Survey reports from June 12 and July 21, 2011, and the MBC progress report from October 29, 2012).

No nesting birds were observed during the survey, and there was no sign of recent nesting activity. Two birds were seen briefly roosting on a dead myoporum before flying away: one Anna's hummingbird (*Calypte anna*) and one house sparrow (*Passer domesticus*). One western fence lizard (*Sceloporus occidentalis*) was observed within the iceplant. None of the plants or animals observed was considered threatened or endangered by the state or federal governments.

Respectfully,

MBC *Applied Environmental Sciences*

Shane Beck
Principal Scientist / Designated Biologist

TABLE 2-14

Hazardous Materials and Wastes Usage and Storage during Construction and Operations*

Material	Purpose and Location	Usage/Day	Maximum Stored	Storage Type
A300- low hazard corrosion inhibitor	South of Unit 4 boiler	75 gal.	100 gal.	Steel drum, tote bin
Acetylene (C2H2) 99.80%	Southwest of warehouse	3,530 cu ft	10,950 cu ft	Cylinder
Ammonium Bicarbonate	South of Unit 4 boiler	400 lb.	600 lb.	Bag
Ammonium bifluoride NH4HF2	Chemical cleaning of HRSG	As needed	Temporary only	Portable vessel
Aqua ammonia (19%)	West of Unit 5 and 7	10 gal.	700 gal.	Steel tote (2)
Aqueous ammonia (29%) NH4(OH)	NOx emissions control. Top of hill and other locations	1500 gal.	20,000 gal.	Underground tank
Argon	Warehouse, south side and other locations	850 cu ft	1,410 cu ft	Cylinder
Asbestos Containing Debris	Hazardous waste storage area and accumulation areas	2,000 lb.	15,000 lb.	Steel drum
Bleach	North of Units 3, 4; southwest of Units 5 and 7	1,500 gal.	2,600 gal.	Aboveground tank
Calgon C-9 Corrosion Inhibitor	Chemical storage room, chemical feed areas	250 lb.	600 lb.	Plastic/Nonmetallic Drum
Calgon H-510 Microbiocide	Chemical storage room, chemical feed areas	250 lb.	600 lb.	Plastic/Nonmetallic Drum
Cardox –carbon dioxide	Unit 7 2nd level west side	3 tons	5 tons	Tank inside building
ChelClean 665 Chelating Agent	South of Unit 4 boiler	50,000 lb.	89,000 lb.	Poly tank
Citric acid	Chemical cleaning of HRSG, feedwater systems	As needed	Temporary only	Portable vessel
CuSol Solvent Waste	South of Unit 4	100,000 gal.	180,000 gal.	Tank wagon
Dielectric Solvent	Unit 7 Aux. bay southwest corner; Unit 4 Aux. bay south end.	110 gal.	330 gal.	Steel drum
Diesel fuel	Warehouse, southwest side	110 gal.	165 gal.	Steel drum
Di-, tri-sodium phosphate solution	Boiler water pH/scale control	5 lb.	800 gal	Portable vessel
EDTA chelant	Chemical cleaning of HRSG, feedwater systems	As needed	Temporary only	Portable vessel
Elimin-ox - Oxygen scavenger	Feedwater oxygen control. Under Unit 3 boiler and Unit 5 chemical area	500 gal.	800 gal.	Tote bin
EPA Protocol Mix (1.0% O2)	Warehouse, southwest side	282 cu ft	564 cu ft	Cylinder
EPA Protocol Mix (Nitric Oxide/Nitrogen[12.75ppm])	Warehouse, southwest side	564 cu ft	1,410 cu ft	Cylinder
EPA Protocol Mix (17% O_2)	Warehouse, southwest side	564 cu ft	1,410 cu ft	Cylinder
Flammable Gas Mixture#1	Warehouse, south side	846 cu ft	1,410 cu ft	Cylinder
Flammable Gas Mixture#2	Warehouse, southwest side	846 cu ft	1,410 cu ft	Cylinder
Flammable Gas Mixture#3	Warehouse, south side	846 cu ft	1,410 cu ft	Cylinder
Flammable Gas Mixture#4	Warehouse, southwest side	846 cu ft	1,410 cu ft	Cylinder

TABLE 2-14

Hazardous Materials and Wastes Usage and Storage during Construction and Operations*

Material	Purpose and Location	Usage/Day	Maximum Stored	Storage Type
Flammable Gas Mixture#5 (72% Methane)	Warehouse, south side	846 cu ft	1,410 cu ft	Cylinder
Helium	Warehouse southwest side	282 cu ft	846 cu ft	Cylinder
~~Hydrazine (N2H4) 35%~~	~~Unit 3 Turbine Deck, Unit 5 Heater Deck~~	~~500 gallons~~	~~850 gallons~~	~~Tote bin~~
Hydrochloric acid HCl	Chemical cleaning of HRSG	As needed	Temporary only	Portable vessel
Hydrogen	Unit 3 northwest side, ground level	30,000 cu ft	40,000 cu ft	Cylinder
Hydrogen	Generator cooling.	8,000 cu ft	70,000 cu ft	Tank, carbon steel
Lubricating Oil	Unit 5 ground floor; southwest Unit 7, Unit 3 & 4 ground floor.	27,800 gal	40,500 gal	Aboveground tank, steel drum.
Mineral Spirits	Paint shack	20 gallons	50 gallons	Can
Mineral Oil	Transformers at Units 1, 2, 3, and 4	87,800 gal	88,000 gal	Transformers
Nalco 350-corrosion inhibitor	Under Unit 3 boiler and Unit 5 chemical area	500 gal.	800 gal.	Tote bin
Nalco 356-corrosion inhibitor	Under Unit 3 boiler and Unit 5 chemical area	500 gal.	800 gal.	Tote bin
Nalco BT 3000	Boiler water treatment. Under Unit 3 boiler and Unit 5 chemical area	500 gal.	800 gal.	Tote bin
Nalco EG 5010	Boiler alkalinity control. Under Unit 3 boiler and Unit 5 chemical area.	500 gal.	800 gal.	Tote bin
Neutralizing amine solution	Feedwater pH control	5 lb.	800 gal	Portable vessel
Nitrogen	Unit 3 north side	106,000 cu ft	141,265 cu ft	Aboveground tank, cylinder
Non-RCRA Hazardous Waste Silicone Grease and Debris	Hazardous waste storage area and accumulation area	55 lb.	110 lb.	Steel drum
Oil Contaminated Soil/Solids	Hazardous waste storage area and accumulation area	220 lb.	1,100 lb.	Steel drum
Oxides of Nitrogen Mix (Nitric Acid 34 PPM)	Warehouse, southwest side	564 cu ft	1,410 cu ft	Cylinder
Oxides of Nitrogen Mix(Nitric Oxide 59.50 PPM)	Warehouse, southwest side	564 cu ft	1,128 cu ft	Cylinder
Oxides of Nitrogen Mix(Nitric Oxide 125 PPM)	Warehouse, southwest side	846 cu ft	1,410 cu ft	Cylinder
Oxidizer	South of Unit 4 boiler	30,000 cu ft	45,000 cu ft	Cylinder trailer
Oxygen scavenger solution	Feedwater oxygen control	2.5 lb.	800 gal.	Portable vessel
Oxygen Mix (8.5% O2)	Warehouse, southwest side	564 cu ft	1,410 cu ft	Cylinder
Oxygen – gaseous oxygen	Warehouse, south side	1,128 cu ft	3,666 cu ft	Cylinder
Paint	Paint shack	25 gallons	100 gallons	Can
Propane	Warehouse, southwest side	200 gal.	400 gal.	Cylinder
Selig Formula 229 Degreaser	Unit 7 Aux. bay southwest corner; Unit 4 Aux. bay south end.	110 gal.	110 gal.	Steel drum

TABLE 2-14

Hazardous Materials and Wastes Usage and Storage during Construction and Operations*

Material	Purpose and Location	Usage/Day	Maximum Stored	Storage Type
Sodium Hypochlorite 12.5% wt NaOCl	Southwest of Units 5&7, North of Units 3&4	1500 gal.	2,600 gal.	Aboveground storage tank
Sodium nitrite NaNO2	Chemical cleaning of HRSG	As needed	Temporary only	Portable vessel
Sulfuric acid for station Batteries	Electrical/ctrl bldg. Combustion turbine/miscellaneous	As needed	600 gal 732 gal 100 gal	Battery Battery Battery
Sulfur hexafluoride	Circuit Breakers	As needed		Compressed gas cylinder
Waste Hydrazine and Debris	Hazardous waste storage area and accumulation area	55 lb.	110 lb.	Steel drum
Waste Lubricating Oil	Hazardous waste storage area and accumulation area	220 lb.	550 lb.	Steel drum
Waste Mineral Oil for Transformers	Hazardous waste storage area and accumulation area	110 lb.	330 lb.	Steel drum
Waste Oil & Solvent	Hazardous waste storage area and accumulation area	450 lb.	1350 lb.	Steel drum
Waste Paint & Thinner	Hazardous waste storage area and accumulation area	55 lb.	110 lb.	Steel drum
Waste Paint Chips and Debris (with Benzene & Lead)	Near Paint shack and hazardous waste storage area	110 gal.	165 gal.	Steel drum
Waste Paint Solids/Sludge	Hazardous waste storage area and accumulation area	55 gal.	165 gal.	Steel drum
Waste Solvent and Debris	Hazardous waste storage area and accumulation area	55 lb.	110 lb.	Steel drum

*Reference: NRG, 2000 Business Plan Update, November.

Information based on Table 5.15-2 from 00-AFC-14)