GW - 28

Phase Separated Hydrocarbon (PSH) Wells

ARCADIS
Infrastructure · Water · Environment · Buildings

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Ms. Catherine Goetz
New Mexico Office of the State Engineer
1900 W 2nd Street
Roswell, New Mexico 88201

Subject:
Work Plan for Abandonment of Select Remedial Wells
Former Baltimore Aircoil Company Facility Site, Merced, California.

ENVIRONMENT

Dear Ms. Goetz:

ARCADIS U.S. (ARCADIS) has prepared this *Work Plan for Abandonment of Select Remedial Wells* (WP) on behalf of Navajo Refining Company (Navajo) for the Artesia Refinery (site) located in Artesia, New Mexico (Figure 1). This WP has been prepared to propose the abandonment of three recovery wells (RWs) that have historically operated as a part of the shallow groundwater oil recovery system at the site. The wells proposed for abandonment (RW-12, RW-13, and RW-14) were replaced in 2011 in association with remedial system upgrade and optimization activities. A summary of recovery system operations and the proposed scope of work are discussed in the following sections.

Date:
November 5, 2014

Contact:
Pamela Krueger

Phone:
713.953.4816

Email:
pam.krueger@arcadis-us.com

Our ref:
TX000870.0006.00001

Background

A recovery trench system was installed on the west side of Bolton Road in 1992 to capture groundwater and phase-separated hydrocarbon (PSH) within the shallow groundwater. The Bolton Road recovery trench was constructed to a depth of 25 feet below ground surface (bgs) and backfilled with pea gravel to create high permeability zones to allow capture and collection of PSH and groundwater. Three collection points were created within the trenches, consisting of 24-inch corrugated metal piping that had been perforated. The three collection points were identified as recovery "wells" RW-12, RW-13, and RW-14. The locations of the Bolton Road trench and the three recovery wells are shown in Figure 2.

During 2011, a preliminary design for upgrading the recovery system was developed, which proposed addition of several system components, primarily to replace pumps and controls that were no longer operating effectively. Construction of the upgrades began in December 2011 and was completed in April 2012. Replacement wells were installed slightly to the west of wells RW-12, RW-13, and RW-14 to allow groundwater to be pumped from 25 to 35 feet bgs. Additionally, new conveyance piping was installed to convey recovered groundwater and PSH from the new recovery wells to the refinery for processing.

ARCADIS proposes to abandon the replaced wells as they are no longer required for optimized system operations, and they present a potential hazard due to their proximity to Bolton Road.

Proposed Well Abandonment Activities

The specific scope of work proposed for abandonment of three RWs at the site is discussed below.

Pre-Field Activities

Prior to initiating field activities, ARCADIS will obtain permits from New Mexico Office of the State Engineer (OSE). In accordance with the *Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells*, as defined in Section 19.27.4 of the New Mexico Administrative Code (NMAC), ARCADIS has prepared a Well Plugging Plan of Operations (Attachment 1) detailing the proposed method of abandonment.

Concurrent with permitting activities, ARCADIS will review and update the existing site-specific Health and Safety Plan (HASP) to incorporate the proposed scope of work, as required by the Occupational Health and Safety Administration (OSHA) Standard "Hazardous Waste Operations and Emergency Response" guidelines (29 CFR 1910.120). The HASP will be reviewed by field staff and contractors before beginning field operations at the site.

Infrastructure Removal and Electrical Disconnection

Prior to well abandonment activities, ARCADIS and Navajo personnel will disconnect the equipment and utilities associated with the former wells. A qualified electrician will identify and shut off all energy source disconnects/shut off points at each location and lock out/tag out the infrastructure following site protocol and procedures specified in the HASP. All infrastructure associated with the groundwater and oil extractions pumps remaining in RW-12, RW-13, and RW-14 will be removed. Conveyance lines connected to the former recovery system network will be cut and capped at a location to be determined based on field conditions.

Proposed Well Destruction Activities

ARCADIS will supervise a New Mexico licensed drilling company, as specified in 19.27.4 NMAC, during the well destruction operations. Subsection C of 19.27.4.30 NMAC specifies well plugging should be conducted by filling the constructed well

from bottom upwards with neat cement slurry, bentonite based plugging material, or another sealing material as approved by the state engineer. ARCADIS requests a variance from the required abandonment method due to the location of the wells within the trenches associated with the active recovery system. The RWs proposed for abandonment span the entire width of the recovery trenches; therefore, placement of neat cement within the screened interval will eliminate communication within the trench and reduce the effectiveness of the engineered remediation system. ARCADIS proposes to backfill the three RWs with pea gravel within the saturated interval to ensure continued effective operation of the PSH recovery system.

Proposed abandonment methods are described in Attachment 1 and listed in the table below. Depth intervals specified in Table 1 may be modified based on field conditions, because well construction logs are not available for the RWs. A generalized construction diagram is included as Attachment 2.

Table 1 Summary of Proposed Well Plugging Plan

Well ID	Total Depth (ft)	Boring Diameter (ft)	Maximum Historical DTP (ft bTOC) [1]	Gravel Interval (ft bgs) [2]	Transition Sand (ft bgs)	Neat Grout (ft bgs)	Native Backfill (ft bgs)
RW-12	25	2	19.00	14-25	12-14	2-12	0-2
RW-13	25	2	18.08	13-25	11-13	2-11	0-2
RW-14	25	2	18.37	13-25	11-13	2-11	0-2

Abbreviations:
ft feet
bTOC below top of casing
bgs below ground surface
DTP depth to product

Notes:
1. top of casing is assumed to be near ground surface
2. gravel placed to 5 feet above maximum historical DTP

Wells will first be backfilled with pea gravel to five feet above the maximum historical groundwater level to ensure continued hydraulic communication along the recovery trench. Following gravel placement, a filter cloth will be placed above the gravel. A two foot thick interval of transition sand will be placed on the filter cloth to ensure appropriate bedding for grout overlying the pea gravel. The remaining interval will be abandoned by backfilling the well with neat cement grout using a tremie pipe to two feet below ground surface to create an adequate seal to eliminate preferential pathways and mitigate potential vapor migration. The corrugated metal casing will be then cut off at two feet bgs and removed. Air monitoring will be conducted throughout the duration of the filling and casing removal activities to ensure that

concentrations of constituents of concern and flammable vapors do not exceed action levels established in the HASP. Following adequate curing time for the grout column and removal of the metal casing, the hole will be backfilled with native soil to ground surface consistent with surrounding site conditions.

The equipment removed from each well, including pumps, hoses, electrical cables, and the corrugated-metal piping will be transported to the refinery for proper characterization and disposal.

Schedule and Reporting

ARCADIS is prepared to initiate the coordination of fieldwork activities, upon approval of this WP. A summary of field activities completed within the scope of this WP will be included in the subsequent *Annual Groundwater Monitoring Report*, which will be submitted to both the New Mexico Environment Department Hazardous Waste Bureau and the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division.

If you have any questions or comments, please contact Pam Krueger by telephone at 713.953.4816 or by e-mail at pam.krueger@arcadis-us.com.

Sincerely,

ARCADIS U.S., Inc.

Pamela R. Krueger
Senior Project Manager

Enclosures:
Figure 1 – Site Location Map
Figure 2 – Well Locations
Attachment 1 – Well Plugging Plan of Operations
Attachment 2 – Well Construction Diagram

Copies:
Robert Combs, Navajo Refining Company LLC
Leona Tsinnijinnie, NMED
Carl Chavez, OCD

ARCADIS

Figures

CITY:(Reqd) DIV/GROUP:(Reqd) DB:(Reqd) LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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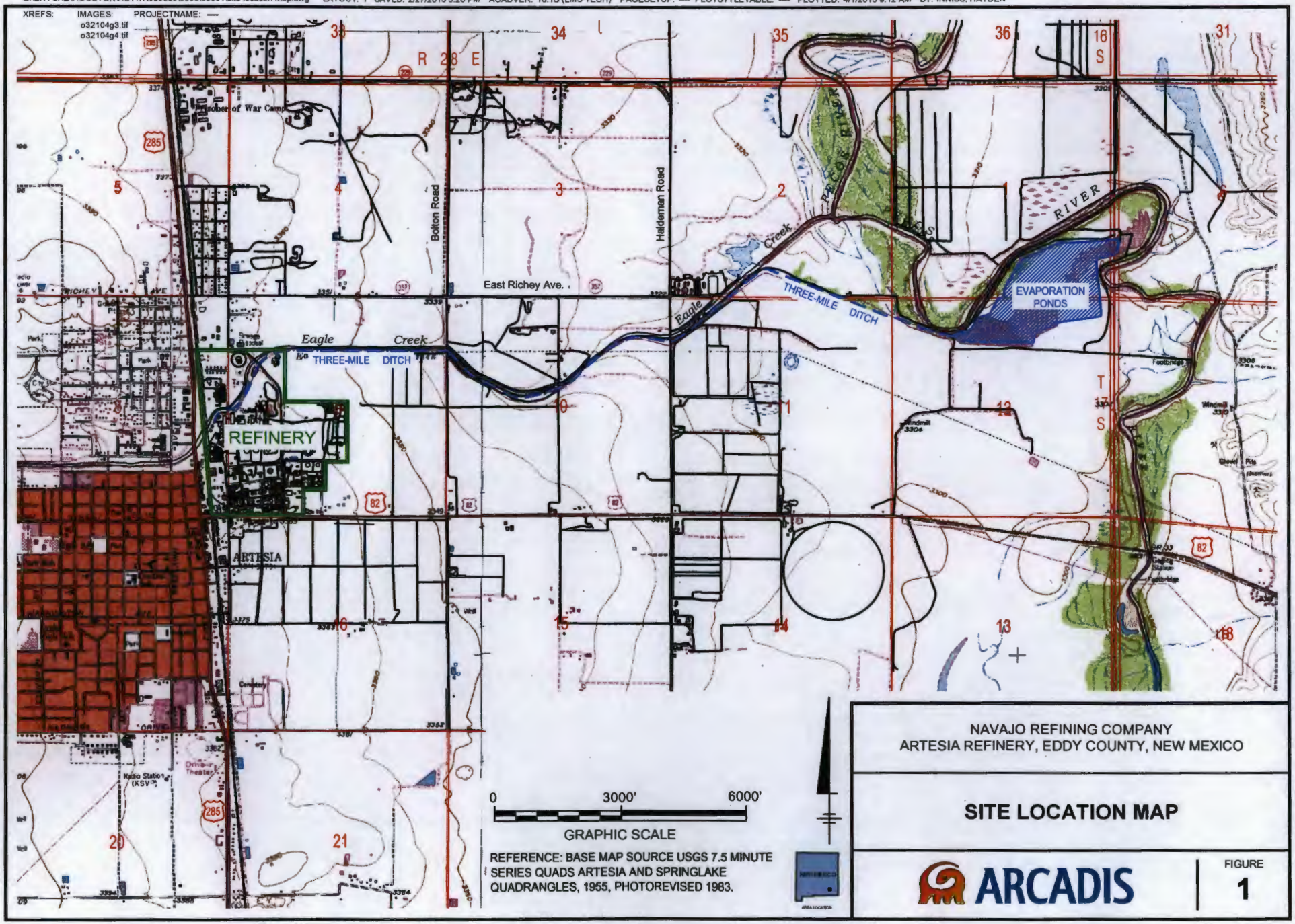


0 3000' 6000'

GRAPHIC SCALE

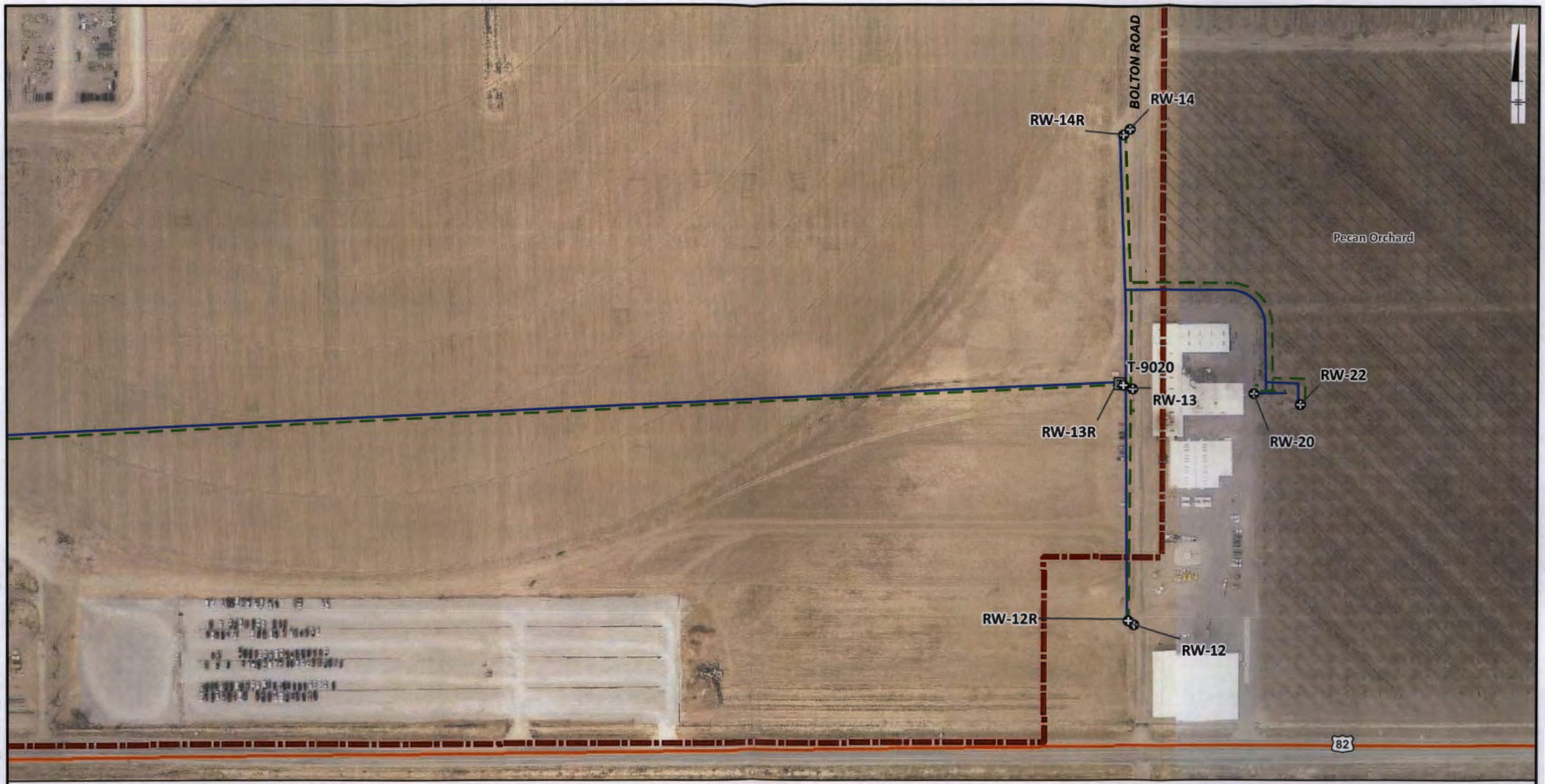
REFERENCE: BASE MAP SOURCE USGS 7.5 MINUTE SERIES QUADS ARTESIA AND SPRINGLAKE QUADRANGLES, 1955, PHOTOREVISED 1983.

NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO

SITE LOCATION MAP

ARCADIS

FIGURE
1



Legend

- RECOVERY WELL
- PRODUCT PUMP STATION
- HYDROCARBONS LINE ROUTE
- WATER LINE ROUTE
- REFINERY BOUNDARY

0 200 400 Feet

GRAPHIC SCALE

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

LNAPL RECOVERY SYSTEM
BOLTON ROAD AREA

ARCADIS

FIGURE
2

Document Path: Z:\GIS\PROJECTS_ENV\NavajoRefining\ArtesiaRefinery\LNAPLAssessment\MXD\piping_figure4.mxd

ARCADIS

Attachment 1

Well Plugging Plan of Operations

WELL PLUGGING PLAN OF OPERATIONS

NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: RW-13

Name of well owner: Navajo Refining Company, LLC.

Mailing address: 501 E Main St

City: Artesia State: New Mexico Zip code: 88211

Phone number: 575-746-5382 E-mail: Robert.combs@hollyfrontier.com

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: National EWP

New Mexico Well Driller License No.: WD-1686 Expiration Date: 10-31-15

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan. Not available

1) GPS Well Location: Latitude: 32 deg, 50 min, 40.95605 sec
Longitude: 104 deg, 22 min, 41.86693 sec, NAD 83

2) Reason(s) for plugging well: Replacement well was installed in 2011 to optimize recovery performance. Existing well is no longer needed and is unprotected, in close proximity to roadway.

3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.

4) Does the well tap brackish, saline, or otherwise poor quality water? Yes If yes, provide additional detail, including analytical results and/or laboratory report(s): The well is located within a shallow aquifer containing separate phase hydrocarbons. Groundwater is impacted with hydrocarbon-related contaminants.

5) Static water level: 18 feet below land surface / feet above land surface (circle one)

6) Depth of the well: 25 feet

7) Inside diameter of innermost casing: 24 inches.

8) Casing material: corrugated metal

9) The well was constructed with:

X an open-hole production interval, state the open interval: _____

_____ a well screen or perforated pipe, state the screened interval(s): _____

10) What annular interval surrounding the artesian casing of this well is cement-grouted? Unknown

11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? Yes If yes, please describe: _____

_____

12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: The well shall be plugged with gravel from the bottom of the well to five feet above the maximum depth to water, followed by a two foot layer of transition sand, and grouted to two feet below ground surface with a tremie pipe. The final two feet will be backfilled with native soil.

2) Will well head be cut-off below land surface after plugging? Yes

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

1) For plugging intervals that employ cement grout, complete and attach Table A.

2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.

3) Theoretical volume of grout required to plug the well to land surface: 211 gallons

4) Type of Cement proposed: Type 1

5) Proposed cement grout mix: 5.2 gallons of water per 94 pound sack of Portland cement.

6) Will the grout be: _____ batch-mixed and delivered to the site

X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: 3% to 5% Bentonite "Pure"

8) Additional notes and calculations: The Bentonite will be Pre-Mixed with .6 gallons of water for each 1% added

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Please see attached work plan. The variance from OSE regulations is based on supporting operation of the active oil recovery system at the site. The recovery wells are connected by a collector trench that conveys recovered oil to the recovery wells. The RWs proposed for abandonment span the width of the trench; therefore grouting within the screened interval will effectively eliminate communication of the trench with other RWs along the transect.

VIII. SIGNATURE:

I, Bryan Nydoska, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Signature of Applicant — Date: 10/3/14

IX. ACTION OF THE STATE ENGINEER:

This Well Plugging Plan of Operations is:

_____ Approved subject to the attached conditions.
_____ Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this _____ day of _____, _____

Scott A. Verhines, State Engineer

By: _____

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			2
Bottom of proposed interval of grout placement (ft bgl)			12
Theoretical volume of grout required per interval (gallons)			235
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			5.2
Mixed on-site or batch-mixed and delivered?			Mixed on-site
Grout additive 1 requested			Bentonite
Additive 1 percent by dry weight relative to cement			3% to 5%
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant of grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			

WELL PLUGGING PLAN OF OPERATIONS

NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: RW-12

Name of well owner: Navajo Refining Company, LLC.

Mailing address: 501 E Main St

City: Artesia State: New Mexico Zip code: 88211

Phone number: 575-746-5382 E-mail: Robert.combs@hollyfrontier.com

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: National EWP

New Mexico Well Driller License No.: WD-1686 Expiration Date: 10-31-15

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan. Not available

1) GPS Well Location: Latitude: 32 deg, 50 min, 35.92739 sec
Longitude: 104 deg, 22 min, 41.81504 sec, NAD 83

2) Reason(s) for plugging well: Replacement well was installed in 2011 to optimize recovery performance. Existing well is no longer needed and is unprotected, in close proximity to roadway.

3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.

4) Does the well tap brackish, saline, or otherwise poor quality water? Yes If yes, provide additional detail, including analytical results and/or laboratory report(s): The well is located within a shallow aquifer containing separate phase hydrocarbons. Groundwater is impacted with hydrocarbon-related contaminants.

5) Static water level: 19 feet below land surface / feet above land surface (circle one)

6) Depth of the well: 25 feet

7) Inside diameter of innermost casing: 24 inches.

8) Casing material: corrugated metal

9) The well was constructed with:

X an open-hole production interval, state the open interval: _____

_____ a well screen or perforated pipe, state the screened interval(s): _____

10) What annular interval surrounding the artesian casing of this well is cement-grouted? Unknown

11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? Yes If yes, please describe: _____

_____

12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: The well shall be plugged with gravel from the bottom of the well to five feet above the maximum depth to water, followed by a two foot layer of transition sand, and grouted to two feet below ground surface with a tremie pipe. The final two feet will be backfilled with native soil.

2) Will well head be cut-off below land surface after plugging? Yes

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

1) For plugging intervals that employ cement grout, complete and attach Table A.

2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.

3) Theoretical volume of grout required to plug the well to land surface: 235 gallons

4) Type of Cement proposed: Type 1

5) Proposed cement grout mix: 5.2 gallons of water per 94 pound sack of Portland cement.

6) Will the grout be: _____ batch-mixed and delivered to the site

X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: 3% To 5% Pure Bentonite

8) Additional notes and calculations: The Bentonite will be pre-mixed with .6 gallons of water for each 1% added

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Please see attached work plan. The variance from OSE regulations is based on supporting operation of the active oil recovery system at the site. The recovery wells are connected by a collector trench that conveys recovered oil to the recovery wells. The RWs proposed for abandonment span the width of the trench; therefore grouting within the screened interval will effectively eliminate communication of the trench with other RWs along the transect.

VIII. SIGNATURE:

I, Bryan Nydeska, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Signature of Applicant — Date: 11/3/14

IX. ACTION OF THE STATE ENGINEER:

This Well Plugging Plan of Operations is:

_____ Approved subject to the attached conditions.
_____ Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this _____ day of _____, _____

Scott A. Verhines, State Engineer

By: _____

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			2
Bottom of proposed interval of grout placement (ft bgl)			11
Theoretical volume of grout required per interval (gallons)			211
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			5.2
Mixed on-site or batch-mixed and delivered?			Mixed on-site
Grout additive 1 requested			3% to 5%
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant of grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			

WELL PLUGGING PLAN OF OPERATIONS

NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: RW-14

Name of well owner: Navajo Refining Company, LLC.

Mailing address: 501 E Main St

City: Artesia State: New Mexico Zip code: 88211

Phone number: 575-746-5382 E-mail: Robert.combs@hollyfrontier.com

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: National EWP

New Mexico Well Driller License No.: WD-1686 Expiration Date: _____

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan. Not available

1) GPS Well Location: Latitude: 32 deg, 50 min, 46.51775 sec
Longitude: 104 deg, 22 min, 41.97289 sec, NAD 83

2) Reason(s) for plugging well: Replacement well was installed in 2011 to optimize recovery performance. Existing well is no longer needed and is unprotected, in close proximity to roadway.

3) Was well used for any type of monitoring program? Yes If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.

4) Does the well tap brackish, saline, or otherwise poor quality water? Yes If yes, provide additional detail, including analytical results and/or laboratory report(s): The well is located within a shallow aquifer containing separate phase hydrocarbons. Groundwater is impacted with hydrocarbon-related contaminants.

5) Static water level: 18 feet below land surface / feet above land surface (circle one)

6) Depth of the well: 25 feet

7) Inside diameter of innermost casing: 24 inches.

8) Casing material: corrugated metal

9) The well was constructed with:

X an open-hole production interval, state the open interval: _____

_____ a well screen or perforated pipe, state the screened interval(s): _____

10) What annular interval surrounding the artesian casing of this well is cement-grouted? Unknown

11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? Yes If yes, please describe: _____

_____

12) Has all pumping equipment and associated piping been removed from the well? No If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: The well shall be plugged with gravel from the bottom of the well to five feet above the maximum depth to water, followed by a two foot layer of transition sand, and grouted to two feet below ground surface with a tremie pipe. The final two feet will be backfilled with native soil.

2) Will well head be cut-off below land surface after plugging? Yes

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

1) For plugging intervals that employ cement grout, complete and attach Table A.

2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.

3) Theoretical volume of grout required to plug the well to land surface: 211 gallons

4) Type of Cement proposed: Type 1

5) Proposed cement grout mix: 5.2 gallons of water per 94 pound sack of Portland cement.

6) Will the grout be:_____ batch-mixed and delivered to the site

X mixed on site

7) Grout additives requested, and percent by dry weight relative to cement: 3% to 5% Pure Bentonite

8) Additional notes and calculations: The bentonite will be pre-mixed with 6 gallons of water for each 1% added

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Please see attached work plan. The variance from OSE regulations is based on supporting operation of the active oil recovery system at the site. The recovery wells are connected by a collector trench that conveys recovered oil to the recovery wells. The RWs proposed for abandonment span the width of the trench; therefore grouting within the screened interval will effectively eliminate communication of the trench with other RWs along the transect.

VIII. SIGNATURE:

I, Bryan Nydoske, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Signature of Applicant — Date: 11/3/14

IX. ACTION OF THE STATE ENGINEER:

This Well Plugging Plan of Operations is:

_____ Approved subject to the attached conditions.
_____ Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this _____ day of _____, _____

Scott A. Verhines, State Engineer

By: _____

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			2
Bottom of proposed interval of grout placement (ft bgl)			11
Theoretical volume of grout required per interval (gallons)			211
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			5.2 ~~3% to 5%~~
Mixed on-site or batch-mixed and delivered?			Mixed on-site
Grout additive 1 requested			3% to 5%
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

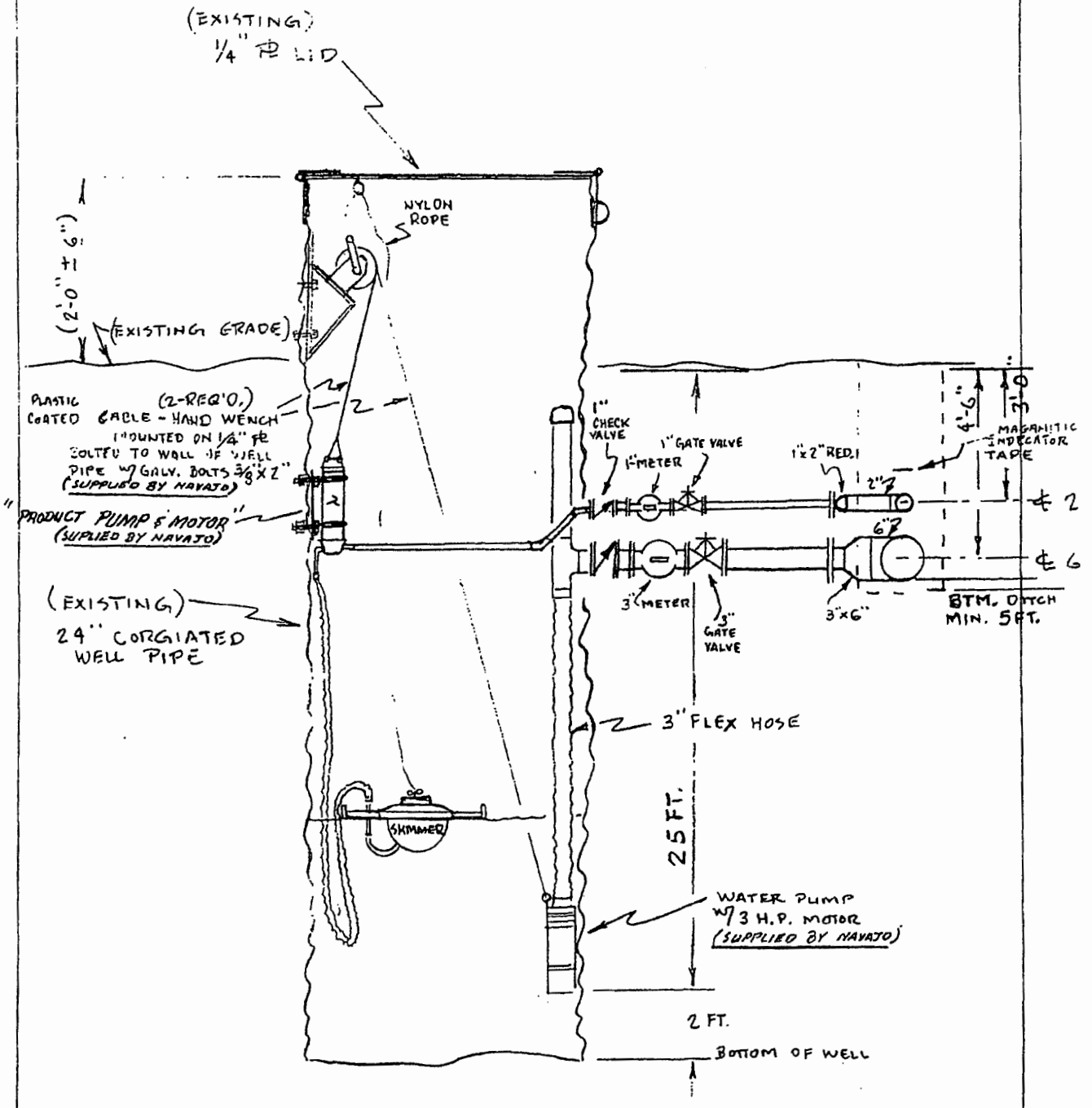
TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)			
Bottom of proposed sealant of grout placement (ft bgl)			
Theoretical volume of sealant required per interval (gallons)			
Proposed abandonment sealant (manufacturer and trade name)			

ARCADIS

Attachment 2

Well Construction Diagram



" WET WELL STAND PIPE (TYPICAL) OF (FOUR) "

BOLTON RD. COLLECTION SYSTEM FOR WELL # 1, 2, 3 & 4
SKETCH - 01
NO SCALE 8-12-93

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD
Sent: Tuesday, March 01, 2011 8:09 AM
To: Moore, Darrell; 'Lackey, Johnny'
Cc: VonGonten, Glenn, EMNRD; Monzeglio, Hope, NMENV; Dade, Randy, EMNRD
Subject: Navajo Refining Company- Artesia Refinery (GW-028) Product Recovery Design Report (January 2011) Approval with Conditions

Darrell and Johnny:

Good morning.

The OCD and NMED (agencies) have completed their review of the "Groundwater and Product Recovery System Basis of Design" report (Report) dated January 2011.

The agencies hereby **approve** the Report with the following comments, questions, requirements and/or conditions based on the Report:

The operator had indicated in a past meeting that the last product recovery system was designed with too few lift stations, small diameter (this design is using 2 inch. diameter HDPE) pipeline, and improperly sized pumps, and weather conditions may have caused problems during the Winter Therefore, the operator must ensure that the past design flaw that resulted in product recovery shut-down does not occur again- especially since this system will need to operate for the long term.

Therefore, the agencies are cognizant of the last design product recovery design failure that rendered the system ineffective due to lack of lift stations, small diameter pipelines, pumps with insufficient power and/or capacity to push product down the lines over long distances, and probably the high iron concentrations in ground water with iron scaling issue an ever present concern to disrupting flow in the lines. Based on the extent of product throughout the facility, the system design must be of long-term duration (24/7 365 days per year) without disruption. Anything less with disruptions to the flow will be deemed an improper engineering design that the operator must again seek professional engineers to design a system that will be fail proof and/or reliable.

OCD Discharge Permit:

Due to the remedial nature of the product recovery flow lines, the process lines and system shall not fall under the pipeline testing section or requirements of the permit.

The double wall product recovery storage tank diagrams display a vent line and tank overflow line directed to secondary containment; thus, a BMP liner with berms is recommended beneath these tanks to identify and capture releases from the lines, etc. Fluids shall be evacuated within 72 hours in any system product recovery secondary containment system.

Safety:

The pumps that handle free-product must be intrinsically safe to reduce the chance(s) of fire(s) and/or explosion(s).

Weather Conditions:

The product recovery system must be constructed to withstand seasonal freezing conditions with undisrupted flow conditions to occur 24/7 for 365 days per year. The agencies do not see where insulated HDPE or steel lines for above and below ground lines are proposed. For example, Bolton Road pipelines are buried, but no details about insulation and/or burial depth below frost line were provided. Similarly, no details on the insulation of the overhead lines were provided and are now requested. Also, will the above ground double-line tanks and/or pump stations are adequately insulated to prevent freeze ups? Insulated buildings are typically constructed for this reason.

Operations:

The operator shall submit within 3 months of system startup, a product recovery efficiency test report with information from each location where product is removed from ground water shall be submitted to the agencies. The information shall demonstrate graphically and in tables the volume of water vs. product and product thickness over time with flow variations

that support the final flow rate setting or incremental setting that is most efficient to capture product at each location. Contact the OCD for an example of an approved demonstration at another facility if you have questions about this.

The operator shall monitor, record and submit with the annual report flow rate information (i.e., monthly vs. cumulative per well, product thickness, and relevant data) from the product recovery system. If the system or any part of the product recovery system breaks down or is disrupted for more than 24 hours, notification within 72 hours of knowledge of break down shall be given to the agencies.

It is not clear how the depression of the water table will be monitored to show capture. This demonstration should also be provided in the annual report.

System Construction:

The operator shall complete phase I by COB June 30, 2011. Completion dates for Phases II and III were not stated in the Report and are hereby requested for approval based on this communication.

Larger diameter pipelines are recommended with clean-outs to offset iron scale build-up over time and reduce stress on the pumps to help ensure non-disruptive flow in the system throughout its operation.

An adequate number of pipeline cleanout locations shall be installed at proper locations to ensure iron scale buildup over time does not cause disruption of flow through the lines. Iron scale can cause significant blockage in a line at bends and is known to be present in ground water at elevated levels of concern.

Waste Water:

All fluids routed to process sewers must go through the API Separator and treatment process.

Please note that this product recovery system that is designed to remove the source for the dissolved phase plume(s) and may not be all that is required to stop the migration of product and the dissolved phase ground water plume from migrating off-property by the agencies. Please contact me if you have questions. Thank you.

Note: Please be advised that NMOCD approval of this plan does not relieve Navajo Refining Company of responsibility should their operations fail to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD approval does not relieve Navajo Refining Company of responsibility for compliance with any other federal, state, or local laws and/or regulations.

xc: OCD Online File GW-028 "Phase Separated Hydrocarbon (PSH) Wells"

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
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"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

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February 9, 2011

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr.,
Santa Fe, New Mexico 87505

RE: GROUNDWATER AND PRODUCT RECOVERY SYSTEM DESIGN

Carl,

Enclosed, please find the basis of design for our upgrade of the recovery system at Navajo Refining – Artesia. If there are any questions, please contact me at 575-746-5281.

Sincerely,
NAVAJO REFINING COMPANY, LLC

Darrell Moore
Environmental Manager for Water and Waste

Encl:

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MEMO

To:
Johnny Lackey – Environmental Manager
Darrell Moore – Environmental Manager, Water and Waste

Copies:

From:
David R. Hoffman, P.E.

Date:
January 7, 2011

ARCADIS Project No.:
TX000871.0001

Subject:
Navajo Refining Company – Artesia Refinery
Groundwater and Product Recovery System Basis of Design

This Basis of Design (BOD) Memorandum presents the proposed modifications to the groundwater and product recovery system at the Navajo Refinery located in Artesia, New Mexico (Refinery). This document presents the following:

- Overview of the refinery and the general permit requirements
- Basis of design, including the system layout and components
- Instrumentation and controls
- Utility requirements
- General equipment description
- Schedule of Implementation

1.0 Overview

Site Description - Navajo Refining Company operates a 100,000 barrel-per-day petroleum refinery located at 501 East Main Street in the city of Artesia, Eddy County, New Mexico (**Figure 1**). The refinery owns 270 acres inside the City limits of Artesia. The refinery has been in operation since the 1920's and processes crude oil into asphalt, fuel oil, gasoline, diesel, jet fuel, and liquefied petroleum gas.

The refinery is bordered on the south by Highway 82, to the east by Bolton Road, to the north by Logan Avenue, and to the west by the Santa Fe-Southern Pacific Railroad. The land owned by the refinery to the east toward Bolton Road is leased for agricultural purposes. The off-site land to the east of Bolton Road is a Pecan Farm referred to as the Chase Property.

Shallow Groundwater – Shallow groundwater in the vicinity of the refinery consists of a near-surface saturated zone overlying the main valley fill alluvium and containing water of variable quality in fractured caliche and sand and gravel lenses at depths of 15 to 30 feet below ground surface. This water is under artesian pressure for at least some or most of the year with static water levels 3 to 5 feet above the saturated zones. The general direction of flow in this near-surface saturated zone is to the east past Bolton Road and the Chase Property toward the Pecos River.

Groundwater Impact - The refinery has experienced a series of spill events over the years that have resulted in a light non-aqueous phase liquid (LNAPL) free product accumulation on groundwater. The free product is located beneath the main refinery and extends downgradient past Bolton Road and onto the Chase Property.

Over the past 10 years, numerous independent systems have been installed to capture this material with limited success. The purpose of this program is to create a refinery wide system capable of aggressively addressing this issue. Upon completion, the system will:

- Utilize modern pneumatic skimmer pumps to capture the oil.
- Collect the free product in local tanks, which will then be transferred via a pipe rack based conveyance system to the wastewater treatment plant slop tank (Tank 49), which becomes feed stock for the refinery.
- Utilize groundwater recovery pumps to lower the groundwater table to enhance product flow to the various collection trenches and wells.
- Transfer the recovered groundwater to the plant process sewer.
- Collect the data necessary for proper reporting to regulatory authorties.

The design for upgrading the existing recovery system has been developed to include all of the existing trenches and pumping wells; however, installation and construction will proceed in a staged manner, focusing on those trenches that contain measurable product first. This memo describes the design basis for upgrading the whole system. The planned schedule for implementation is provided in Section 6.0 of this memo.

Applicable Permits - The recovery system is regulated by two permits. These include:

- Discharge Permit GW-028, which was renewed on August 20, 2008, Sections 20 and 21
- RCRA Post-Closure Care Permit (NMD 048918817), issued 1989 and most recently updated December 2010, Sections 4.6 and 4.7.

2.0 Basis of Design

General Layout - The system recovery wells utilized in the upgraded system are located in five primary areas within and near the refinery. These areas and the associated 17 recovery wells are shown in **Figure 2** and include:

1. Northwest Plant Area (RW-1, RW-2, RW-7 and RW-8)
2. Central Plant Area (RW-4, RW-5, RW-6)
3. Flare Area (RW-9 and RW-10)
4. Southeast Plant Area (RW-15 and KWB-4)
5. Bolton Road Area (RW-11, RW-12, RW-13, RW-14, Chase Well (proposed New Chase Well 1), and KWB-8 (proposed New Chase Well 2)).

The area division is based on the general layout of the facility pipe rack system and other site features, rather than any regulatory requirement.

The Process Flow Diagram is included as **Figure 3**. The Piping and Instrumentation Diagrams (P&IDs) are included as **Appendix A.**

This section presents the following information:

- System electrical limitations
- Compressed air system
- Oil recovery
- Groundwater depression

- Bolton Road
- Flow rates
- Recovery well enhancements
- Access

System Electrical Limitations – The current well system is supplied by a series of power drops from local utility lines (Bolton Road) and breaker panels throughout the refinery. This power supply is single phase, which is sufficient to convey the liquids from one point to another unless significant elevation changes are required. Since aboveground piping will be utilized, this piping will be placed in the pipe racks located throughout the refinery. Many sections of these racks are significantly elevated. Therefore, pumps with 480V 3-phase motors will be utilized to supply the required horsepower.

Compressed Air System - Compressed air required by the skimmer pumps will be primarily fed by small local air compressors. The compressors on Bolton Road will be housed in existing steel enclosures to prevent vandalism. Air compressor locations are shown on **Figure 2**. Where accessible, the refinery plant air system will be utilized in lieu of local compressors.

Oil Recovery - The recovery wells will be equipped with pneumatic skimmer pumps. Free product fluids extracted by the pneumatic skimmer pumps will be conveyed through a carbon steel and/or High Density Polyethylene (HDPE) piping to nearby tanks. Seven holding tanks will be utilized in the free product recovery system design, one of which currently exists at the Site (T-006). The remaining tanks will be 500-gal double wall vertical tanks. From the holding tanks, the free product will be conveyed to the slop tank (Tank 49) through carbon steel transfer lines located in the refinery's pipe racks using electric centrifugal pumps.

Groundwater Depression - Groundwater and dissolved phase constituents will be extracted using electric submersible pumps on a manual, as-needed basis. The goal of removing groundwater from the wells will be to locally depress the water level to allow free product to flow by gravity to the wells/recovery trenches. Fluid will be conveyed through carbon steel and/or HDPE transfer line to the nearest process sewer access location. Once in the process sewer line, the fluids will travel to the refinery's on-site Wastewater Treatment Plant (WWTP) and will be further separated in an American Petroleum Institute (API) oil/water separator.

Bolton Road – Bolton is located approximately ½ mile to the east of the refinery. Free product will be removed from the local recovery wells and transferred to a local storage tank (Tank T-020). Centrifugal pumps will then be used to transfer the free product to a storage tank (Tank T-021) located on the southeast side of the refinery. Groundwater will be transferred using the electric submersible pumps in each well to a water storage tank (Tank T-022) adjacent to Tank T-021. Two 2-inch buried HDPE conveyance pipes will transfer the free product and groundwater from Bolton Road to Tanks T-021 and 022.

Flow Rates - Free Product flow rates, based on individual pump capacities, will be 160 gallons per day (gpd), or approximately 1/10 gallons per minute (gpm) per well. The maximum total free product flow rate, based on pump capacities, will be approximately 2 gpm across the refinery. The maximum flow from the groundwater recovery pumps, based on pump capacities, will be approximately 5 gpm per well. However, these pumps will be set up to operate manually on an as needed basis to attract free product to the well/ trench. Since the groundwater recovery flow rates will be intentionally minimized, the average refinery wide flow rate is expected to be less than 10 gpm and will vary significantly with rainfall and free product availability.

Recovery Well Enhancements – Three of the proposed recovery well locations, recovery well KWB-04, the Chase Well, and KWB-08, are not large enough in diameter to serve as suitable recovery wells. Several recovery wells are not currently deep enough to utilize the planned equipment. Recommendations concerning the modification and/or replacement of the wells are included in **Table 1.**

Access - Valves and instrumentation will be located aboveground and immediately adjacent to the wells for ease of maintenance. Off-site, this equipment will be housed in locked and heated Hot Boxes. On plant grounds, the lines will be insulated and heat traced.

3.0 Instrumentation and Controls

The groundwater and product recovery system will be equipped with adequate instrumentation necessary for monitoring of key parameters (e.g., pressure and flow). The instrumentation as it is proposed to be utilized on the recovery system can be seen in the P&IDs (**Appendix A)**. The function of the planned instrumentation is described below.

- Mechanical flow totalizers and air pulse counters will be utilized to record flow for permit compliance. Groundwater recovery lines at each well will be equipped with dedicated totalizers installed inside the Hot Boxes at Bolton Road and adjacent to the wells on the refinery grounds. Air pulse counters will be utilized to estimate instantaneous free product flow from each pumping point. Flow totalizers will be installed following the discharge pumps on each free product storage tank.

- Level transmitters will be installed at the holding tanks to control discharge pump operation.

- Level transmitters will be installed at the recovery wells to control submersible pump operation.

- A Motorized Block Valve will be placed on the influent line to each holding tank. In a high level condition, the motorized block valve will close, which will stop flow to the tank.

- A pressure safety valve (PSV) will be installed on the groundwater discharge line of each recovery well. The set point of the PSVs will be 90% of the pump dead head pressure, or approximately 50 pounds per square inch (psi). This will permit recycle of groundwater to the well if the above mentioned motorized block valve is closed.

4.0 Utility Requirements

Electricity - The extraction system will be designed to utilize 120V, single phase electrical service upstream of the refinery holding tanks and 480V, 3-phase electrical service downstream of the holding tanks. 120V, single phase electrical service will be utilized on the transfer pumps downstream of the holding tank on Bolton Road. The estimated load is summarized in **Table 2**. The estimated full-load amperage is based on simultaneous operation of the air compressors, extraction pumps, and tank discharge pumps.

Compressed Air - Seventeen pneumatic pumps will require compressed air to operate. Based on a maximum assumed required air feed rate of 2 standard cubic feet per minute (scfm) at 90 pounds per square inch gauge (psig), approximately 34 scfm at 90 psig will be required to operate all seventeen pumps simultaneously. Due to the size of the recovery system and the distances between the recovery wells, multiple air compressors will be utilized to accomplish the required line pressure. In most cases, a single compressor will provide compressed air to a single recovery well. In instances where two recovery wells are close together, namely RW-01 and RW-02, RW-09 and RW-10, and Chase 1 and 2, two wells will share an air compressor. Fourteen (14) Speedaire 1NNE7 1.8 HP air compressors, or equivalent, will be installed on the recovery system capable of providing up to 68.6 scfm of compressed air at 90 psig, the line pressure necessary to allow for anticipated line pressure losses, a 50% cycle time, and potential future increases in pumping capacity. Three (3) air compressors are currently onsite and can be utilized in the system upgrades. The expanded use of the plant air system will be evaluated in order to reduce the number of air compressors required for the system.

5.0 General Equipment Description

This section presents a description of the rotating equipment that will be utilized in the groundwater extraction and treatment system. General specifications are provided below. Cut sheets for the proposed pumps are provided in **Appendix B**. Tanks, controls, and other related equipment required for system construction will be specified in the next phase of the design program.

Groundwater Extraction Well Pumps

Quantity:	17
Manufacturer:	Grundfos
Model:	10E5
Capacity:	14 gpm maximum
Dead Head Pressure:	56 psi
Material of Construction:	Stainless Steel
Dimensions:	21-1/8" length x 3-31/32" diameter

Power:	120V

Product Extraction Well Pumps

Quantity:	17
Manufacturer:	QED
Model:	SPG4
Capacity:	0.1 gpm maximum
Material of Construction:	Stainless Steel
Dimensions:	29" length x 3.6" diameter
Air Requirements:	40/100 psi (min/max)

Holding Tank Discharge Pumps (Product In-Plant)

Quantity:	12
Manufacturer:	Goulds
Model:	NPE 1ST
Capacity:	47 gpm
Dead Head Pressure:	49 psi
Material of Construction:	Stainless Steel
HP and Voltage:	1.5 HP and 480V

Holding Tank Discharge Pumps (Product Bolton Road)

Quantity:	2
Manufacturer:	Goulds
Model:	NPE 1ST
Capacity:	47 gpm
Dead Head Pressure:	49 psi
Material of Construction:	Stainless Steel
HP and Voltage:	1.5 HP and 120V

Holding Tank Discharge Pumps (Water In-Plant)

Quantity:	2
Manufacturer:	Goulds
Model:	NPE 2ST
Capacity:	99 gpm
Dead Head Pressure:	30 psi
Material of Construction:	Stainless Steel
HP and Voltage:	1.5 HP and 480V

Air Compressor (AC-100)

Quantity:	14
Manufacturer:	Speedaire
Model:	1NNE7
Capacity:	4.60 SCFM at 125 psi
Motor:	1.8 HP, 120 V, 1 phase

6.0 Schedule of Implementation

The updated recovery system design will be implemented in several phases, focusing on those areas with the most product first. The phases will be as follows:

Phase 1:

- Adjust Tank 49 as needed to receive recovered product
- Install equipment in Bolton Road Area
- Install equipment in Southeast Plant Area
- Install piping from Bolton Road Area and Southeast Plant Area to process sewer and Tank 49

Phase 2:

- Install equipment in Northwest Plant Area
- Install piping from Northwest Plant Area to process sewer and Tank 49

- Install equipment at RW-6 in Central Plant Area
- Install piping from RW-6 to process sewer and Tank 49

Phase 3:

- Install equipment in Flare Area
- Install piping from Flare Area to process sewer and Tank 49
- Install equipment at RW-4 in Central Plant Area
- Install piping from RW-4 to process sewer and Tank 49

Piping installed during Phase 1 and Phase 2 will contain connections for piping to be installed in subsequent phases, as needed.

Phase 1 of the implementation is scheduled to occur during the first half of 2011.

Attachments:

Tables

1. Summary of New or Modified Recovery Wells
2. Summary of Full Load Amperage for LNAPL Recovery System

Figures

1. Site Location Map
2. LNAPL Recovery System Overview
    a. LNAPL Recovery System Northwest Plant and Flare Areas
    b. LNAPL Recovery System Central Plant Area
    c. LNAPL Recovery System Southeast Plant and Central Plant Areas
    d. LNAPL Recovery System Bolton Road Area
3. Process Flow Diagram

Appendices

A. Piping and Instrumentation Diagrams
B. Pump Cut Sheets

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Table 1

2011

Summary of New or Modified Recovery Wells
Basis of Design
Navajo Refinery LNAPL Recovery System
Artesia, NM

Recovery Well ID	Depth to Product	Depth to Water	Depth to Groundwater Pump Inlet**	Total Depth	Required Total Depth***	Depth Addjustment Required	Installation Phase
	(ft BTOC)	(ft BTOC)	(ft BTOC)	(ft BTOC)	(ft BTOC)		
RW-1	10.33	10.35	12.85	18.5	19	NO	2
RW-2	12.50	12.53	15.03	19.4	21	YES	2
RW-4	NP	15.90	18.4	20.45	24	YES	3
RW-5	14.91	17.03	19.53	17.48	25	YES	1
RW-6	16.69	16.84	19.34	16.95	25	YES	2
RW-7	NP	11.36	13.86	20.79	20	NO	2
RW-8	12.41	12.81	15.31	17.97	21	YES	2
RW-9	NP	11.15	13.65	21.84	20	NO	3
RW-10	NP	12.30	14.8	23.97	21	NO	3
RW-11	NP	18.10	20.6	22.9	27	YES	1
RW-12	NP	18.14	TBD	22.71	TBD	YES	1
RW-13	18.08	18.20	20.7	25.92	27	NO	1
RW-14	17.90	18.05	20.55	23.45	26	YES	1
RW-15	16.80	17.22	19.72	21.42	26	YES	1
KWB-4*	22.38	23.95	26.45	41.81	32	NO	1
New Chase 1*	21.30	22.10	24.6	24.25	31	YES	1
New Chase 2*	23.30	27.60	30.1	34.5	36	YES	1

Notes:

ft BTOC	Feet Below Top of Casing
NP	No product present
TBD	To Be Determined. RW-11 and RW-12 will be drilled to a total depth that will be determined in the field to ensure well will retain enough water to support the system.
*	These wells do not have a large enough casing diameter to serve as recovery wells. New wells will be drilled at these locations.
**	Depth to Pump Inlet is 2.5 feet added to the Depth to Water. The 2.5 feet assumes a 1.5 foot draw down based on a 2 foot skimmer float range and includes a minimum 1 foot buffer between the pump inlet and the bottom of the LNAPL layer.
***	Proposed Total Depth is 5 feet added to the depth to the bottom of the pump motor. Grundfos recommends the pump motor be atleast 5 feet above the bottom of a well with a soil bottom.

Table 2
Summary of Full Load Amperage for LNAPL Recovery System
Basis of Design
Navajo Refinery LNAPL Recovery System
Artesia, NM

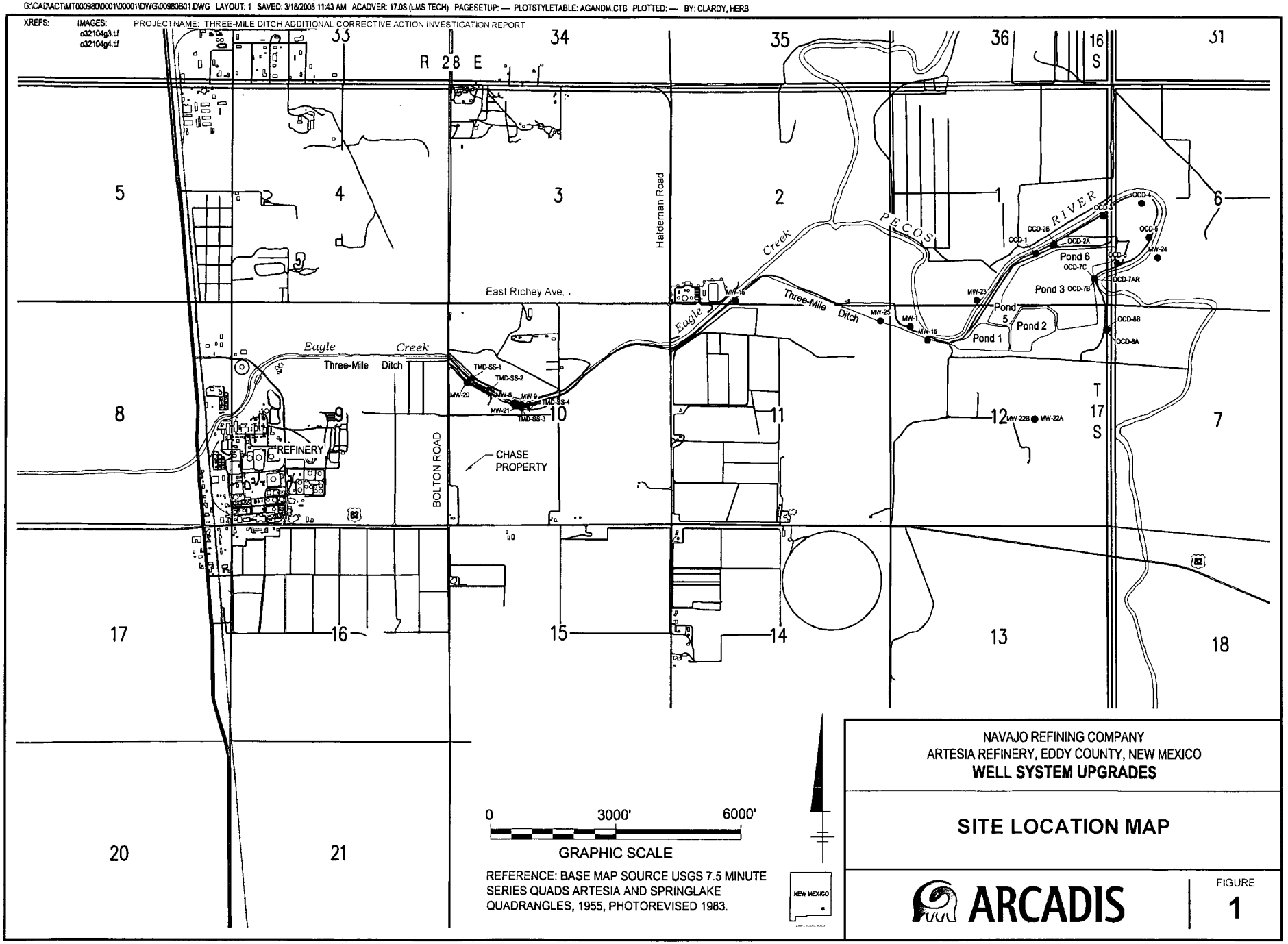
System Component	Full Load Amperage for Specified Equipment (Amps)					Total Full Load Amperage
	Air Compressor	Groundwater Pump	480V Product Transfer Pump	120V Product Transfer Pump	480V Groundwater Transfer Pump	
Recovery Wells*	17	15	NA	NA	NA	32
Bolton Road Transfer Station	NA	NA	NA	16.2	NA	16.2
480V Transfer Stations**	NA	NA	2.4	NA	2.4	4.8

Notes:

NA Not Applicable

* This row represents the full load amperage for each Recovery Well when all electrical equipment is in operation. There are 17 Recovery Wells in the LNAPL Recovery System.

** This row represents the full load amperage for each 480V Transfer Station when one pump is in operation. There are 7 480V Transfer Stations in the LNAPL Recovery System.



NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

SITE LOCATION MAP

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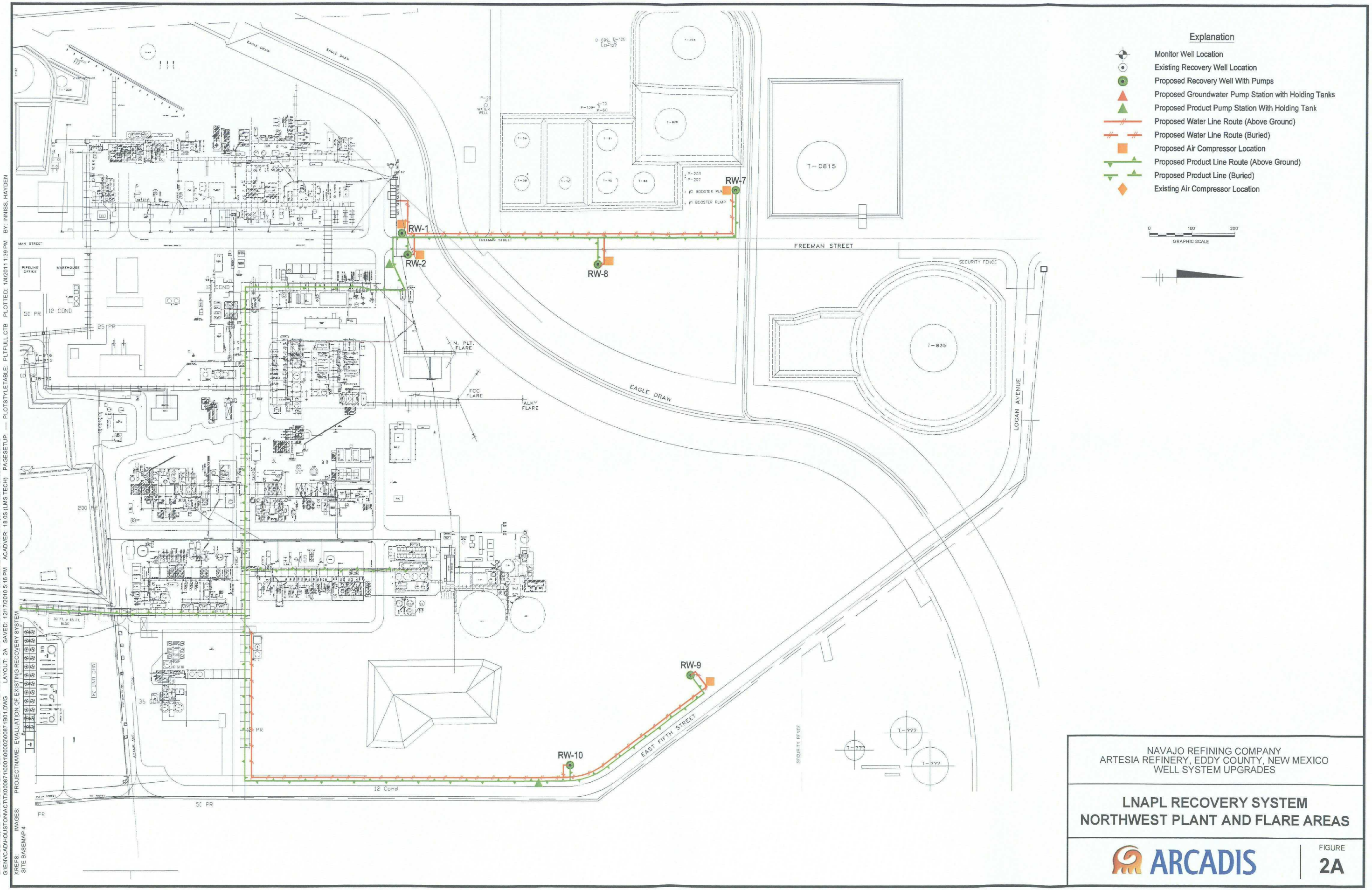
FIGURE
1



NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

LNAPL RECOVERY SYSTEM
NORTHWEST PLANT AND FLARE AREAS

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FIGURE
2A

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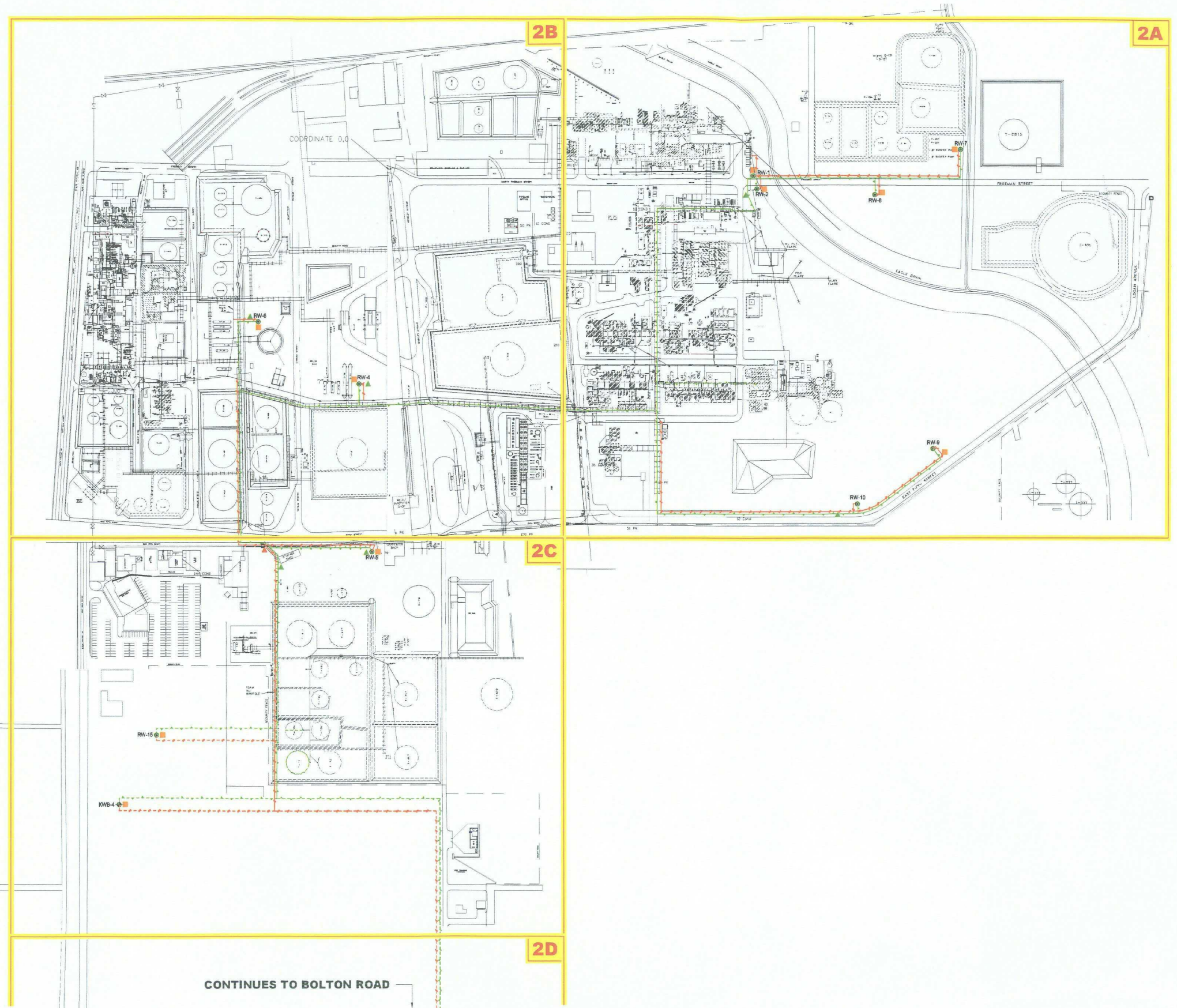
SITE BASEMAP 4
PROJECTNAME: EVALUATION OF EXISTING RECOVERY SYSTEM



Explanation

- Monitor Well Location
- Existing Recovery Well Location
- Proposed Recovery Well With Pumps
- Proposed Groundwater Pump Station with Holding Tanks
- Proposed Product Pump Station With Holding Tank
- Proposed Water Line Route (Above Ground)
- Proposed Water Line Route (Buried)
- Proposed Air Compressor Location
- Proposed Product Line Route (Above Ground)
- Proposed Product Line (Buried)
- Existing Air Compressor Location

0 200' 400'
GRAPHIC SCALE

NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

LNAPL RECOVERY SYSTEM OVERVIEW

ARCADIS

FIGURE 2

CITY: MIDLAND, TX DIVGROUP: ENV DB: H.CLARDY LD: PIC: P.KRUEGER PM: P.KRUEGER TM: C.RAESNER LYR ON:*OFF:*REF* UN: 31-009-00478
G:\ENV\CADD\HOUSTON\ACTIVITY\00087\10001\10000\260871B01.DWG LAYOUT: 2 SAVED: 12/17/2010 5:16 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/4/2011 1:37 PM BY: INNISS, HAYDEN
XREFS:
IMAGES:
SITE BASEMAP 4
PROJECTNAME: EVALUATION OF EXISTING RECOVERY SYSTEM

Explanation

- Monitor Well Location
- Existing Recovery Well Location
- Proposed Recovery Well With Pumps
- Proposed Groundwater Pump Station with Holding Tanks
- Proposed Product Pump Station With Holding Tank
- Proposed Water Line Route (Above Ground)
- Proposed Water Line Route (Buried)
- Proposed Air Compressor Location
- Proposed Product Line Route (Above Ground)
- Proposed Product Line (Buried)
- Existing Air Compressor Location

0 100' 200'
GRAPHIC SCALE

NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

LNAPL RECOVERY SYSTEM
CENTRAL PLANT AREA

ARCADIS

FIGURE
2B

CITY: MIDLAND, TX DIVGROUP: ENV DB: H.CLARDY LD: PIC: P.KRUEGER PM: P.KRUEGER TM: C.RAESNER LYR: ON=*;OFF=*REF* UNI: 31-009-00478
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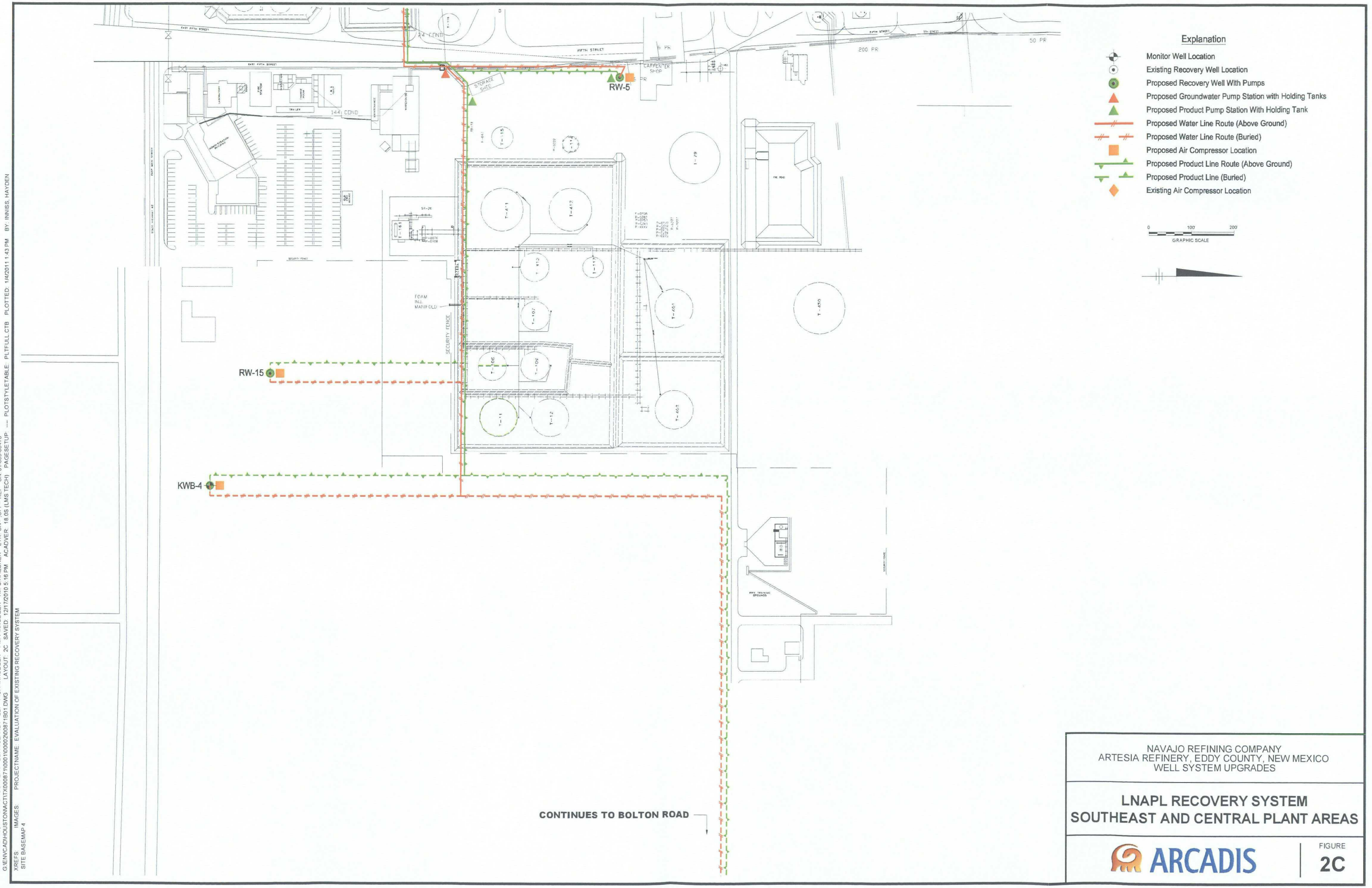
XREFS: IMAGES: PROJECTNAME: EVALUATION OF EXISTING RECOVERY SYSTEM
SITE BASEMAP 4
PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/4/2011 1:41 PM BY: INNISS, HAYDEN



Explanation

- Monitor Well Location
- Existing Recovery Well Location
- Proposed Recovery Well With Pumps
- Proposed Groundwater Pump Station with Holding Tanks
- Proposed Product Pump Station With Holding Tank
- Proposed Water Line Route (Above Ground)
- Proposed Water Line Route (Buried)
- Proposed Air Compressor Location
- Proposed Product Line Route (Above Ground)
- Proposed Product Line (Buried)
- Existing Air Compressor Location

0 100' 200'
GRAPHIC SCALE

NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

LNAPL RECOVERY SYSTEM
SOUTHEAST AND CENTRAL PLANT AREAS

ARCADIS

FIGURE
2C

CITY: MIDLAND,TX DIV/GROUP: ENV DB: H.CLARDY LD: PIC: P.KRUEGER PM: P.KRUEGER TM: C.RAESNER LYR: ON=*;OFF=*REF*;UN: 31-009-00478
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SITE BASEMAP 4

KWB-10

RW-14

RW-13

KWB-8

CHASE WELL

RW-12

BOLTON ROAD

KWB-6

82

MW-57

RW-11

Explanation

- Monitor Well Location
- Existing Recovery Well Location
- Proposed Recovery Well With Pumps
- Proposed Groundwater Pump Station with Holding Tanks
- Proposed Product Pump Station With Holding Tank
- Proposed Water Line Route (Above Ground)
- Proposed Water Line Route (Buried)
- Proposed Air Compressor Location
- Proposed Product Line Route (Above Ground)
- Proposed Product Line (Buried)
- Existing Air Compressor Location

0 100' 200'
GRAPHIC SCALE

NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

LNAPL RECOVERY SYSTEM
BOLTON ROAD AREA

ARCADIS

FIGURE
2D

CITY: MIDLAND, TX DIV/GROUP: ENV DB: H.CLARDY LD: PIC: P.KRUEGER PM: P.KRUEGER TM: C.RAESNER LYR: ON=*;OFF=*REF* UN: 31-009-00478
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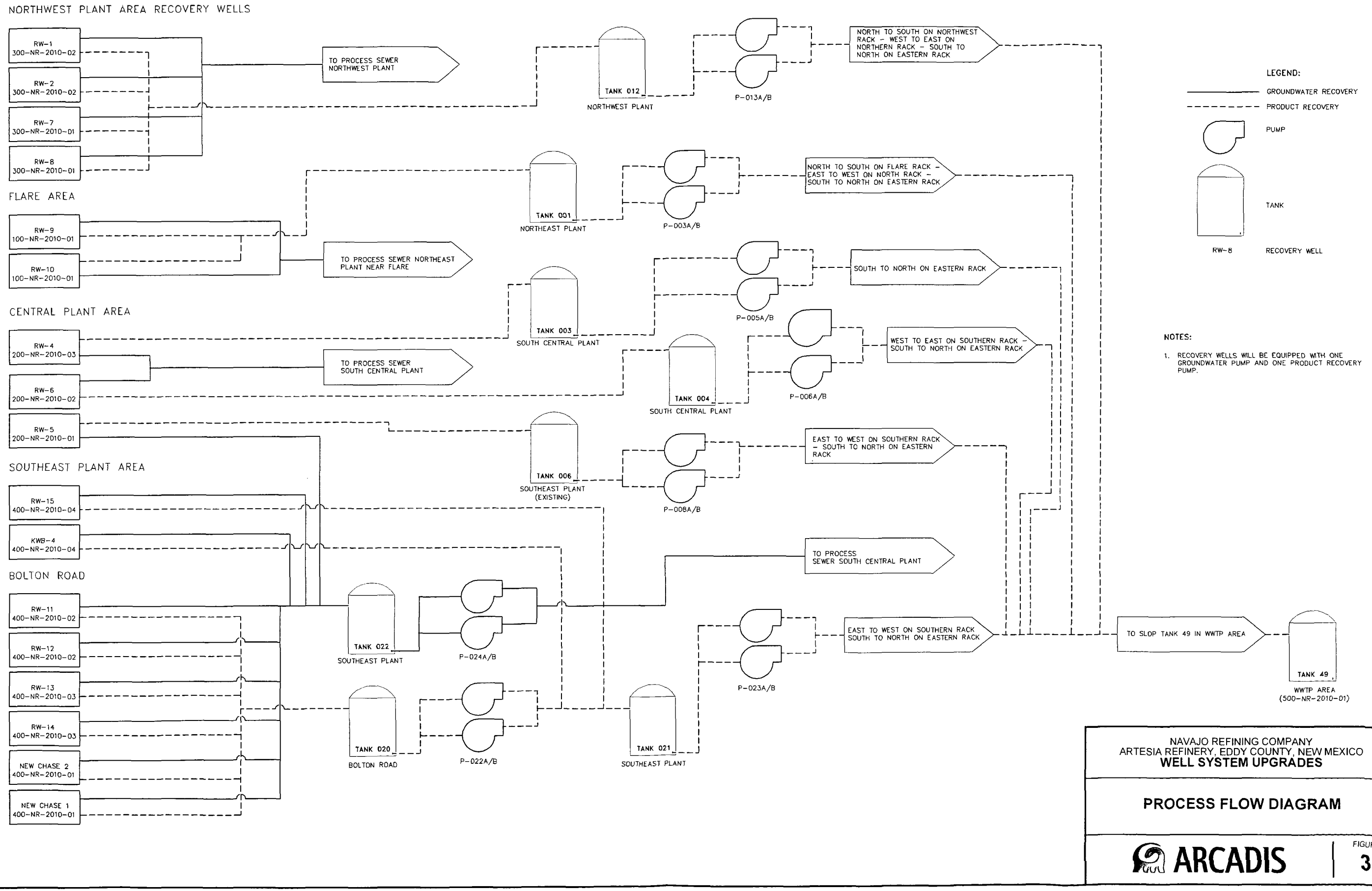
SITE BASEMAP 4



NOTES:

1. RECOVERY WELLS WILL BE EQUIPPED WITH ONE GROUNDWATER PUMP AND ONE PRODUCT RECOVERY PUMP.

NAVAJO REFINING COMPANY
ARTESIA REFINERY, EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

PROCESS FLOW DIAGRAM

ARCADIS

FIGURE
3

LEGEND:

- ABOVEGROUND LINE
- BURIED LINE
- GATE VALVE
- SPEC BREAK
- MOTOR AND COMPRESSOR
- FILTER
- REGULATOR
- PRESSURE SAFETY VALVE
- COMPRESSED AIR LINE
- MOTORIZED BLOCK VALVE
- PITLESS ADAPTOR
- PIPE ENDED WITH BLIND FLANGE
- FLOW ARROW
- CENTRIFUGAL PUMP
- SUBMERSIBLE PUMP
- SKIMMER PUMP

LEGEND CONTINUED:

- LIT — LEVEL INSTRUMENT
- FQI — FLOW QUANTITY INSTRUMENT
- SWING CHECK
- PI — PRESSURE INSTRUMENT
- PID INDENTIFIER
- KI — PULSE COUNTER
- ROUND 3/4" THREADED PLUG

PIPE TAG LEGEND:

PL-003-3/4-CS

PL = TYPE OF PIPE = PRODUCT LINE
003 = PIPE NUMBER
3/4 = PIPE SIZE (DIAMETER)
CS = PIPE MATERIAL – CARBON STEEL

EQUIPMENT NUMBER ABBREVIATED DESCRIPTIONS:

P = PUMP
T = TANK
F = FILTER
R = REGULATOR
PSV = PRESSURE SAFETY VALVE
PL = PRODUCT LINE
WL = WATER LINE
AL = AIR LINE (COMPRESSED)
HV = HAND VALVE
CV = CHECK VALVE
CS = CARBON STEEL
HDPE = HIGH DENSITY POLYETHYLENE
MV = MOTORIZED BLOCK VALVE

AREAS:

000 = LEGENDS AND SYMBOLS
100 = FLARE
200 = CENTRAL PLANT
300 = NORTHWEST PLANT
400 = BOLTON ROAD
500 = TANK 49

000-NR-2010-01

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TIMOTHY WIPPOLD
Professional Engineer's No.: (PE NUM)

State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY ▪ EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

LEGENDS AND SYMBOLS PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

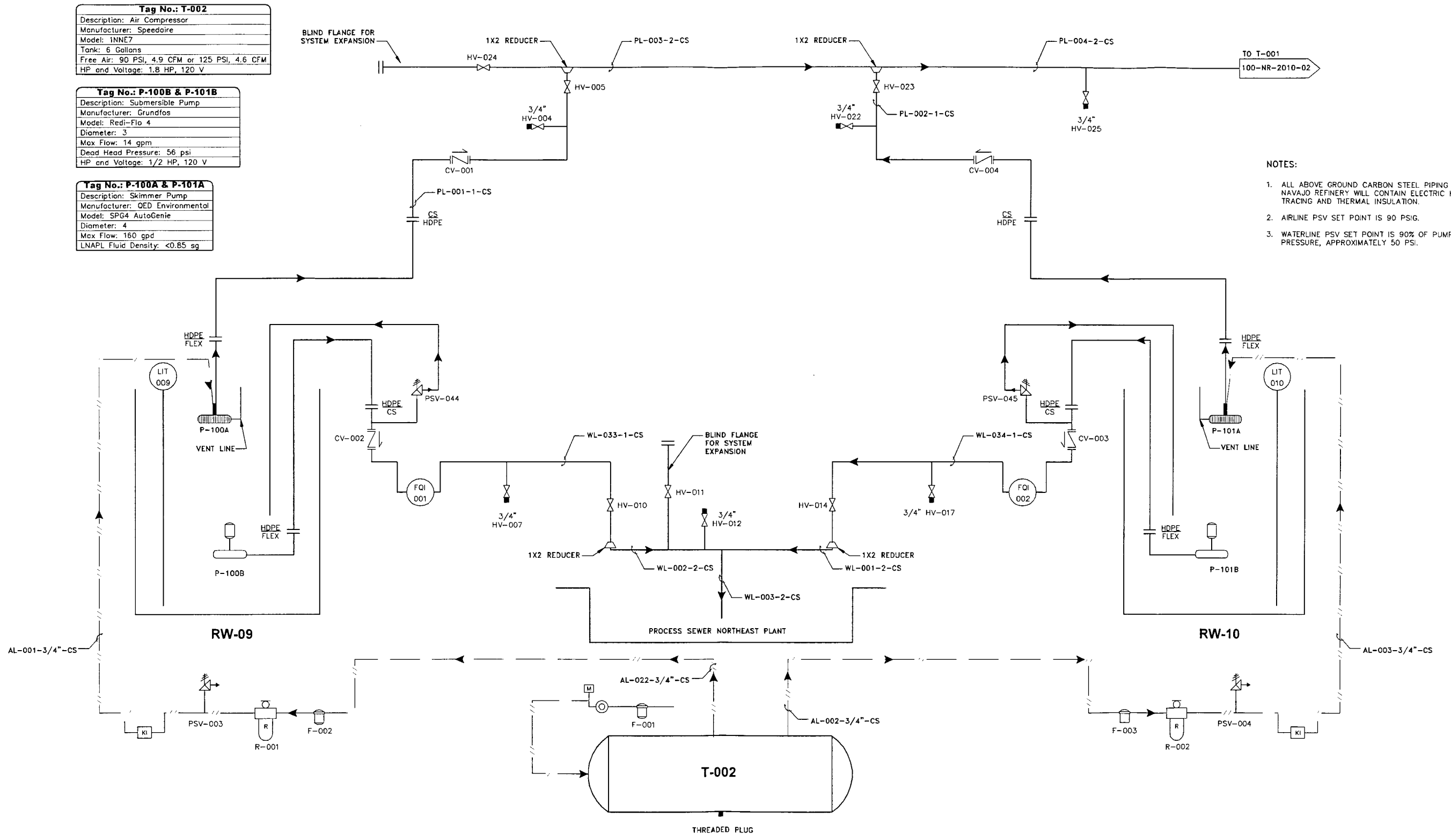
ARCADIS Project No.: TX000871.0001.00002
Date: DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE,
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

Tag No.: T-002
Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

Tag No.: P-100B & P-101B
Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-100A & P-101A
Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg



NOTES:

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

NOT TO SCALE

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Professional Engineer's Name		
TIMOTHY WIPPOLD		
Professional Engineer's No.		
(PE NUM)		
State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	

ARCADIS

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO

WELL SYSTEM UPGRADES

FLARE AREA
PIPING AND INSTRUMENTATION DIAGRAM

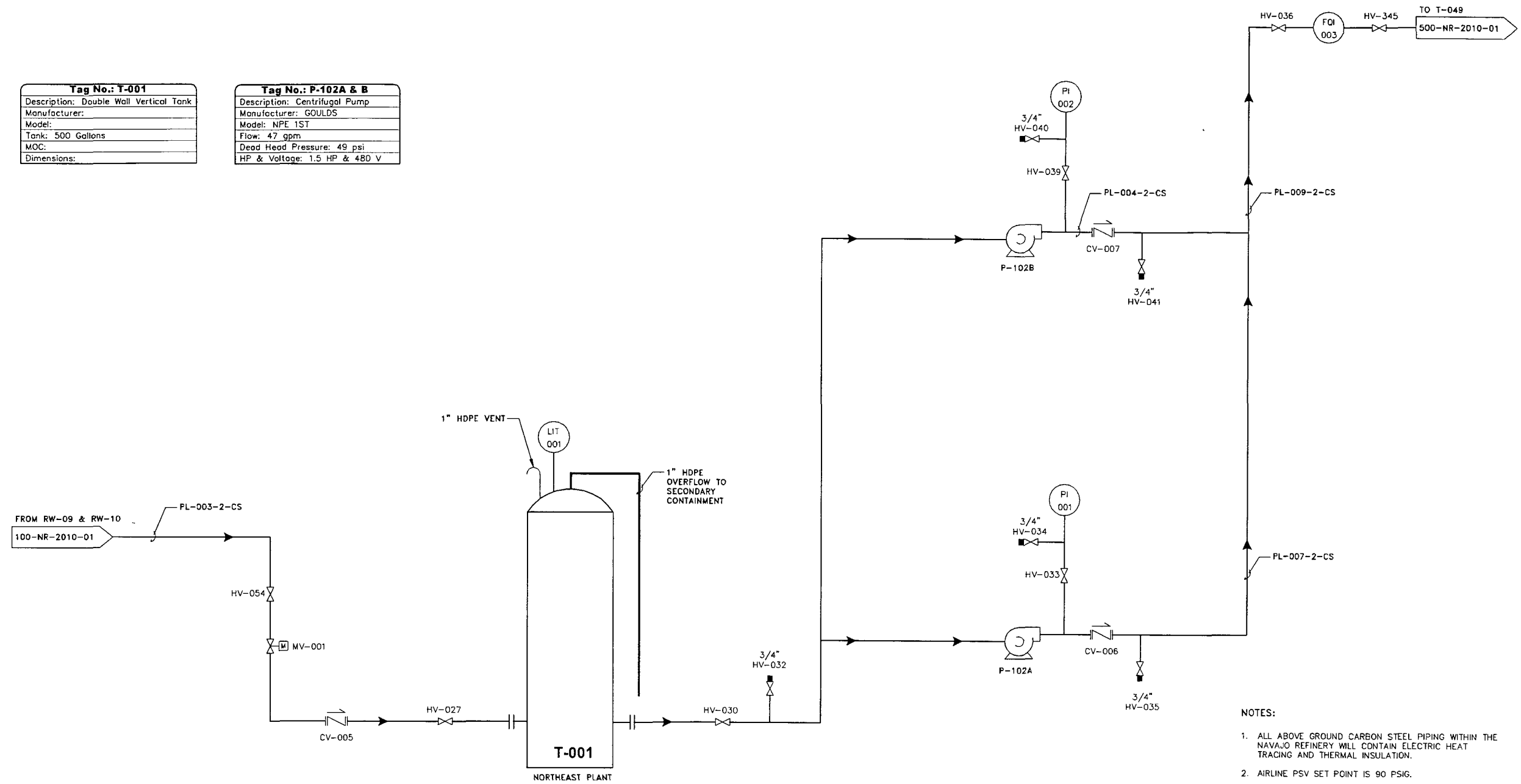
GENERAL

100-NR-2010-01

ARCADIS Project No. TX000871.0001.00002
Date DECEMBER 2010
ARCADIS 2929 BRIARPARK DRIVE, SUITE 300 HOUSTON, TEXAS 77042 TEL. 713.953.4800

Tag No.: T-001
Description: Double Wall Vertical Tank
Manufacturer:
Model:
Tank: 500 Gallons
MOC:
Dimensions:

Tag No.: P-102A & B
Description: Centrifugal Pump
Manufacturer: GOULDS
Model: NPE 1ST
Flow: 47 gpm
Dead Head Pressure: 49 psi
HP & Voltage: 1.5 HP & 480 V



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SCALE(S) AS INDICATED

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name		
TIMOTHY WIPPOLD		
Professional Engineer's No.		
(PE NUM)		
State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	

ARCADIS

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO

WELL SYSTEM UPGRADES

FLARE AREA
PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

100-NR-2010-02

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE.
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

FROM T-021
400-NR-2010-05

PL-018-2-CS

TO RW-06
200-NR-2010-02

CV-026

HV-140

HV-139

3/4" HV-141

3/4" HV-138

PL-017-2-CS

PI 014

3/4" HV-135

HV-134

HV-132

FQI 007

P-201B

CV-024

PL-016-2-CS

3/4" HV-136

PI 013

3/4" HV-149

HV-148

PL-013-2-CS

PL-015-2-CS

PL-014-2-CS

P-201A

CV-023

3/4" HV-131

PI 046

3/4" HV-349

HV-348

FQI 024

HV-137

P-202B

CV-086

3/4" HV-350

HV-341

PI 045

3/4" HV-343

HV-342

3/4" HV-352

P-202A

CV-085

3/4" HV-346

3/4" HV-133

HV-338

Tag No.: T-007

Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

AL-004-3/4"-CS

F-008

T-007

THREADED PLUG

KI

R

F-007

R-005

PSV-009

Tag No.: T-006 &T-022

Description: Double Wall Vertical Tank
Manufacturer:
Model:
Tank: 500 Gallons
MOC:
Dimensions:

Tag No.: P-200B

Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-200A

Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

Tag No.: P-201A & B

Description: Centrifugal Pump
Manufacturer: GOULDS
Model: NPE 1ST
Flow: 47 gpm
Dead Head Pressure: 49 psi
HP and Voltage: 1.5 HP & 480 V

Tag No.: P-202A & B

Description: Centrifugal Pump
Manufacturer: GOULDS
Model: NPE 2ST
Flow: 99 gpm
Dead Head Pressure: 30 psi
HP and Voltage: 1.5 HP & 480 V

LIT 004

1" HDPE VENT

1" HDPE OVERFLOW TO SECONDARY CONTAINMENT

T-006

SOUTHEAST PLANT (EXISTING)

3/4" HV-130

HV-126

WL-012-1-CS

CS HDPE

CV-020

HV-123

HV-124

3/4" HV-124

1X2 REDUCER

MV-002

PL-070-2-CS

HV-125

LIT 008

1" HDPE VENT

1" HDPE OVERFLOW TO SECONDARY CONTAINMENT

T-022

SOUTHEAST PLANT

LIT 011

HDPE FLEX

P-200A

VENT LINE

HDPE FLEX

P-200B

RW-05

HDPE CS

PSV-046

CV-088

FQI 008

WL-004-1-CS

3/4" HV-119

HV-120

1X2 REDUCER

WL-028-2-CS

MV-003

HV-122

3/4" HV-334

FROM BOLTON ROAD AREA
400-NR-2010-05

CV-084

HV-335

PROCESS SEWER SOUTH CENTRAL PLANT

NOTES:

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

NOT TO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING; USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TIMOTHY WIPPOLD
Professional Engineer's No.: (PE NUM)
State: NM | Date Signed: | Project Mgr.: DRH
Designed by: CR | Drawn by: KLS | Checked by: .

ARCADIS

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

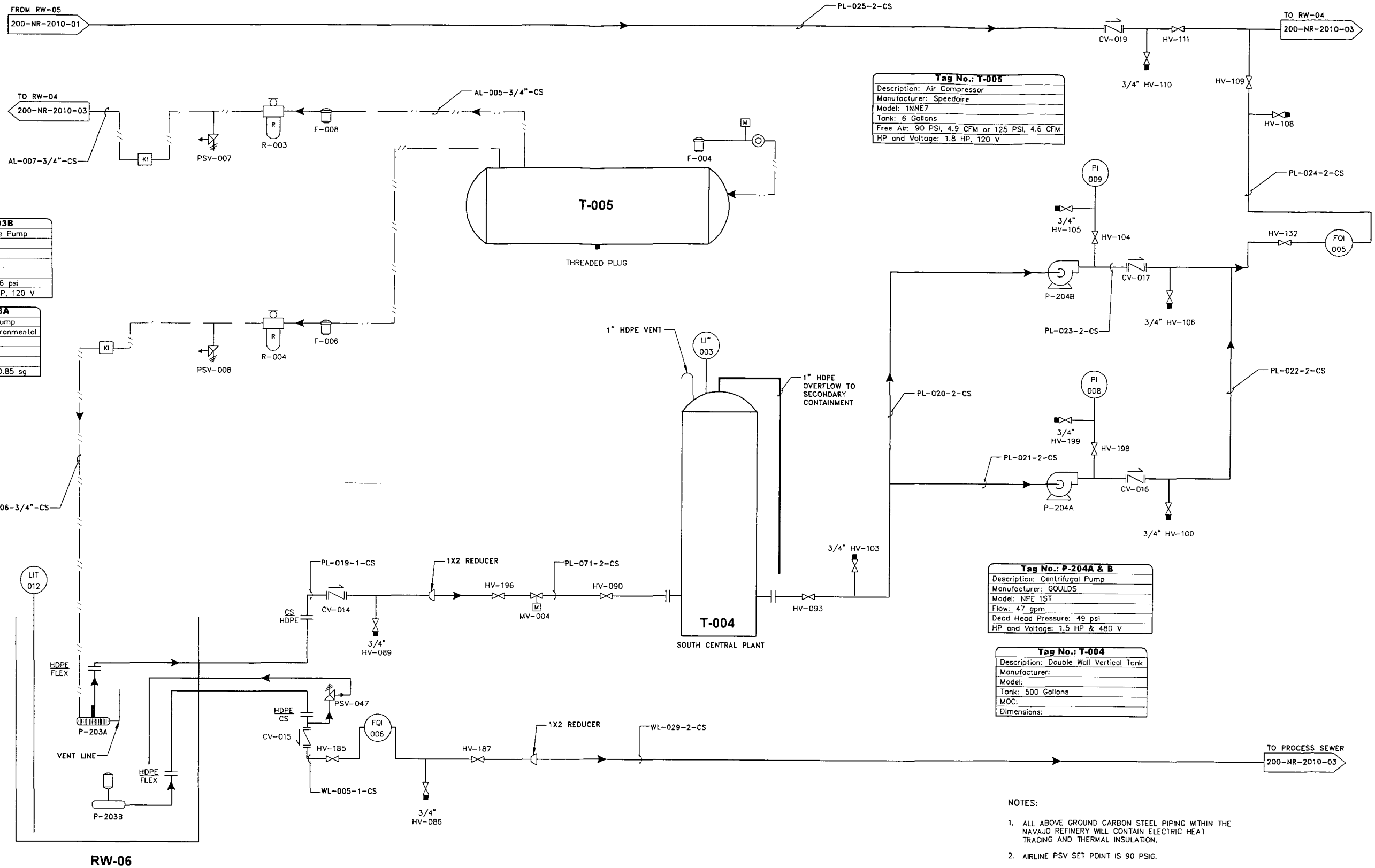
CENTRAL PLANT AREA PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

200-NR-2010-01

ARCADIS Project No.: TX000871.0001.00002
Date: DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE, SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800



NOTES:

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2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

200-NR-2010-02

NOT TO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TIMOTHY WIPPOLD
Professional Engineer's No.: (PE NUM)

State	Date Signed	Project Mgr.
NM		DRH

Designed by	Drawn by	Checked by
CR	KLS	-

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

CENTRAL PLANT AREA PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE.
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

FROM RW-06
200-NR-2010-02

PL-026-2-CS

TO T-049
500-NR-2010-01

HV-078

HV-077

PL-032-2-CS

PI 006

3/4" HV-075

HV-074

HV-070

FQI 030

P-206B

CV-011

3/4" HV-076

PL-031-2-CS

PL-030-2-CS

PI 007

3/4" HV-082

HV-081

PL-028-2-CS

PL-029-2-CS

P-206A

CV-013

3/4" HV-079

3/4" HV-071

HV-067

Tag No.: T-003

Description: Double Wall Vertical Tank
Manufacturer:
Model:
Tank: 500 Gallons
MOC:
Dimensions:

Tag No.: P-205B

Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-205A

Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

Tag No.: P-206A & B

Description: Centrifugal Pump
Manufacturer: GOULDS
Model: NPE 1ST
Flow: 47 gpm
Dead Head Pressure: 49 psi
HP and Voltage: 1.5 HP & 480 V

FROM T-005
200-NR-2010-02

AL-007-3/4"-CS

1" HDPE VENT

LIT 002

1" HDPE OVERFLOW TO SECONDARY CONTAINMENT

T-003

SOUTH CENTRAL PLANT

LIT 013

PL-027-1-CS

1X2 REDUCER

HV-068

HV-064

PL-071-2-CS

CS
HDPE

CV-009

3/4" HV-063

MV-005

HDPE FLEX

P-205A

VENT LINE

HDPE FLEX

P-205B

HDPE CS

PSV-048

CV-008

FQI 004

HV-057

HV-059

1X2 REDUCER

WL-031-2-CS

WL-030-1-CS

3/4" HV-058

WL-029-2-CS

FROM RW-06
200-NR-2010-02

WL-007-2-CS

PROCESS SEWER SOUTH CENTRAL PLANT

PL-028-2-CS

RW-04

NOTES:

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
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NOT TO SCALE

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TIMOTHY WIPPOLD
Professional Engineer's No.: (PE NUM)
State: NM | Date Signed: | Project Mgr.: DRH
Designed by: CR | Drawn by: KLS | Checked by:

ARCADIS
ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

CENTRAL PLANT AREA PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

200-NR-2010-03

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE,
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

Tag No.: T-008 & T-009
Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

Tag No.: P-300B & P-301B
Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-300A & P-301A
Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

NOTES:

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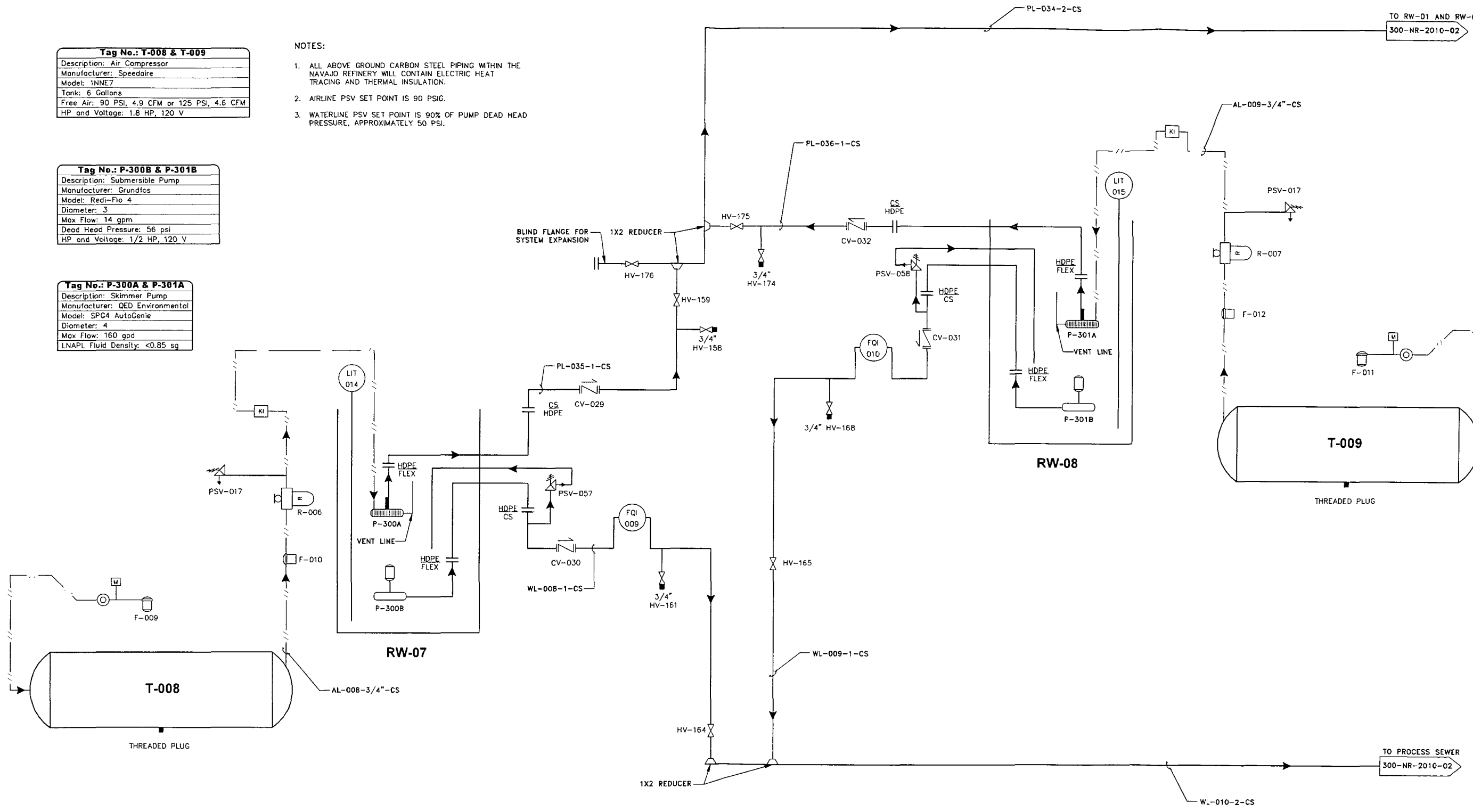

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Professional Engineer's No.		
(PE NUM)		
State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	

ARCADIS

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO

WELL SYSTEM UPGRADES

NORTHWEST PLANT AREA PIPING AND INSTRUMENTATION DIAGRAM

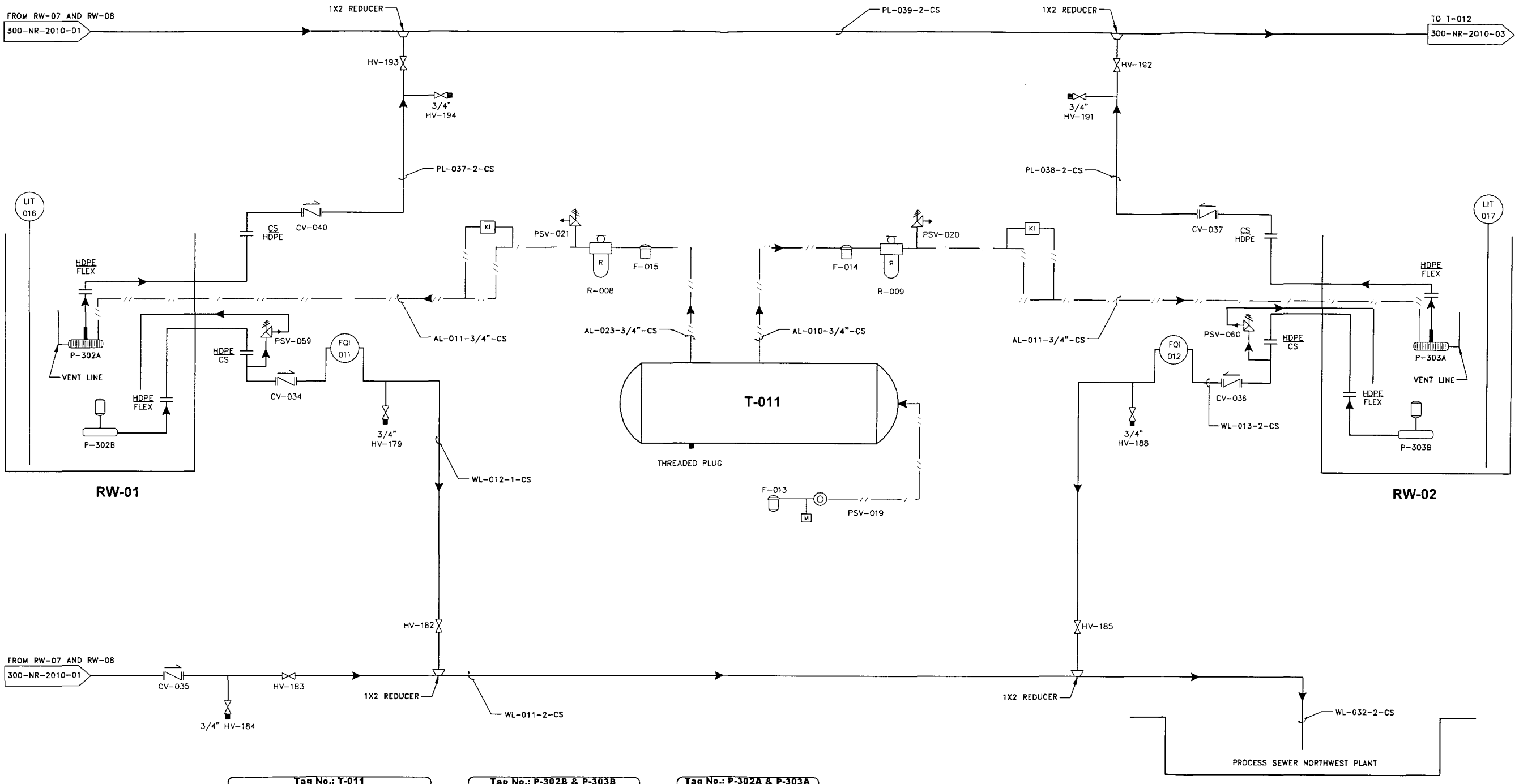
GENERAL

300-NR-2010-01

ARCADIS Project No.
TX00671.0001.00002

Date
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE,
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800



Tag No.: T-011
Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

Tag No.: P-302B & P-303B
Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-302A & P-303A
Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

NOTES:

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300-NR-2010-02

NOT TO SCALE

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TIMOTHY WIPPOLD
Professional Engineer's No.: (PE NUM)
State: NM | Date Signed: | Project Mgr.: DRH
Designed by: CR | Drawn by: KLS | Checked by: .

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

NORTHWEST PLANT AREA PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

ARCADIS Project No.: TX000871.0001.00002
Date: DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE.
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

CITY:SYRACUSE_NY DIVGROUP:ENVICAD DB:K.SARTORI LD:(OPT) PIC:P.KRUEGER PM:P.KRUEGER TM:V.FINOCCHIARO LYR:(OPT)ON=*;OFF=*REF*
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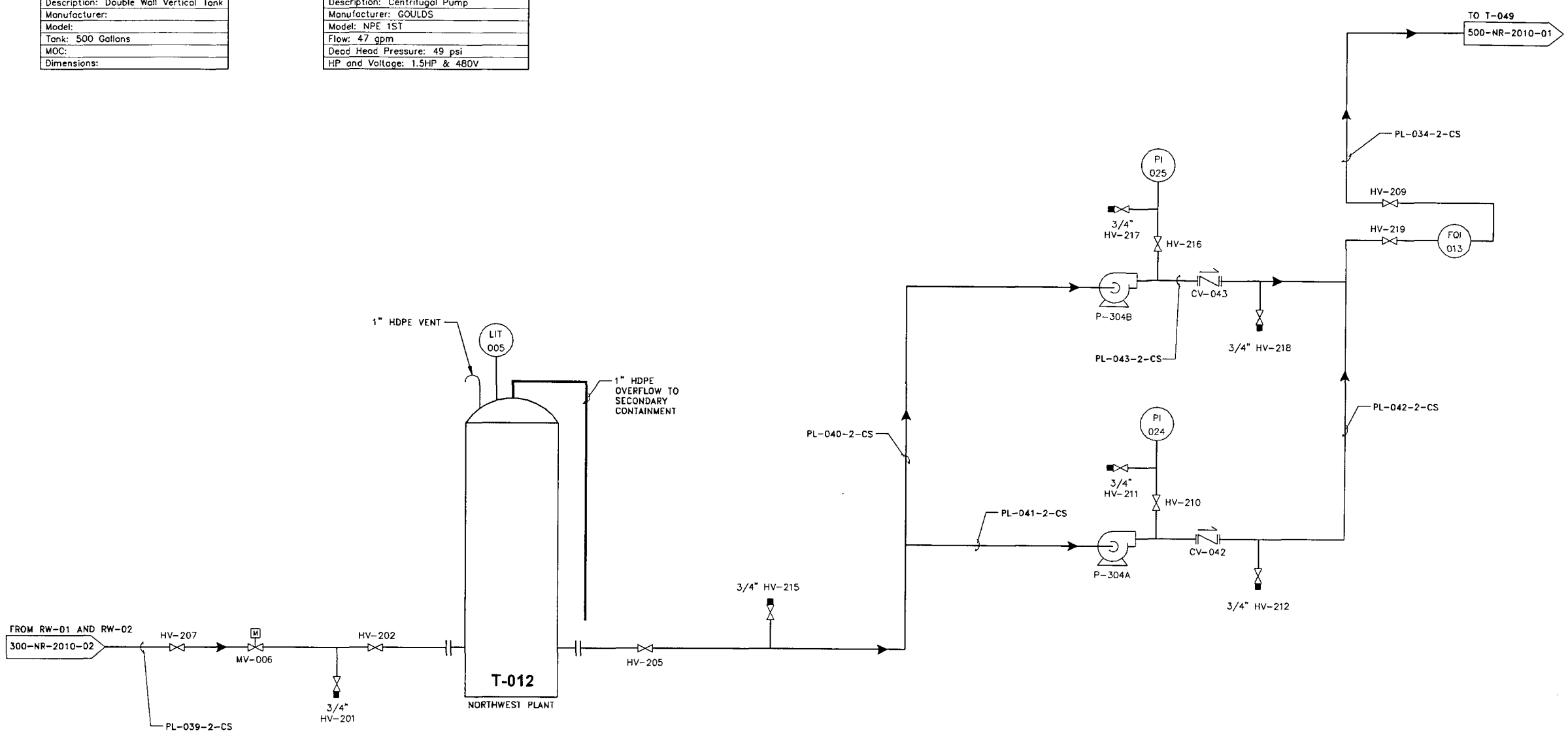
XREFS: IMAGES: PROJECTNAME: ---
0087XD0

Tag No.: T-012
Description: Double Wall Vertical Tank
Manufacturer:
Model:
Tank: 500 Gallons
MOC:
Dimensions:

Tag No.: P-304A & B
Description: Centrifugal Pump
Manufacturer: GOULDS
Model: NPE 1ST
Flow: 47 gpm
Dead Head Pressure: 49 psi
HP and Voltage: 1.5HP & 480V



NOTES:

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

CITY:SYRACUSE, NY DIV/GROUP:ENV/CAD DB:K.SARTORI LD:(OPT) PIC:P.KRUEGER PM:P.KRUEGER TM:V.FINOCCHIARO LYR:(OPT)ON=*;OFF=*REF*
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NOT TO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TIMOTHY WIPPOLD		
Professional Engineer's No.: (PE NUM)		
State: NM	Date Signed:	Project Mgr.: DRH
Designed by: CR	Drawn by: KLS	Checked by:

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

NORTHWEST PLANT AREA PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

300-NR-2010-03

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE,
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

1X2 REDUCER

PL-044-1-HDPE

HOT BOX

HV-220 CS/HDPE

3/4" HV-319

CV-045

CS HDPE

LIT 018

PSV-022

HDPE FLEX

AL-05-3/4"-CS

KI

R

R-010

F-016

P-400A

VENT LINE

PSV-049

HDPE FLEX

P-400B

HDPE CS

FQI 014

CV-046

HV-223

CS HDPE

3/4" HV-222

NEW CHASE WELL 1

WL-014-1-HDPE

1X2 REDUCER

Tag No.: T-013
Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

Tag No.: P-400B & P-401B
Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-400A & P-401A
Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

AL-014-3/4"-CS

AL-024-3/4"-CS

F-017

T-013
EXISTING

THREADED PLUG

F-018

TO T-020
400-NR-2010-05

1X2 REDUCER

PL-045-2-HDPE

PL-046-1-HDPE

HOT BOX

HDPE/CS HV-227

3/4" HV-321

CV-048

CS HDPE

LIT 019

R

R-011

PSV-025

KI

PSV-050

HDPE FLEX

P-401A

VENT LINE

HDPE FLEX

P-401B

HDPE CS

FQI 015

CV-047

HV-232

CS HDPE

3/4" HV-231

NEW CHASE WELL 2

WL-016-1-HDPE

1X2 REDUCER

WL-015-2-HDPE

TO PROCESS SEWER
400-NR-2010-05

NOTES:

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2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

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Professional Engineer's Name		
TIMOTHY WIPPOLD		
Professional Engineer's No.		
(PE NUM)		
State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	

ARCADIS

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO

WELL SYSTEM UPGRADES

BOLTON ROAD AREA
PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

400-NR-2010-01

ARCADIS Project No.
TX000871.0001.00002

Date:
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE,
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

1X2 REDUCER

PL-047-1-HDPE

HOT BOX

CS/HDPE

HV-233

3/4" HV-323

CV-051

CS HDPE

LIT 020

PSV-026

HDPE FLEX

AL-016-3/4"-CS

KI

R

R-012

F-019

P-402A

VENT LINE

HDPE FLEX

P-402B

PSV-051

FQI 016

HDPE CS

CV-052

HV-236

CS HDPE

3/4" HV-235

RW-11

WL-017-1-HDPE

1X2 REDUCER

M

F-020

T-014

THREADED PLUG

M

F-021

T-015

THREADED PLUG

NOTES:

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

Tag No.: T-014 & T015
Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

Tag No.: P-402B & P-403B
Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-402A & P-403A
Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

PL-048-2-HDPE

TO T-020
400-NR-2010-05

1X2 REDUCER

PL-050-1-HDPE

HOT BOX

HDPE/CS

HV-240

3/4" HV-325

CV-054

CS HDPE

LIT 021

AL-017-3/4"-CS

KI

R

R-013

F-022

HDPE CS

P-403A

VENT LINE

HDPE FLEX

P-403B

PSV-031

FQI 017

PSV-052

HDPE CS

CV-053

HV-246

CS HDPE

3/4" HV-245

RW-12

WL-018-1-HDPE

WL-019-2-HDPE

1X2 REDUCER

TO PROCESS SEWER
400-NR-2010-05

NOT TO SCALE

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name		
TIMOTHY WIPPOLD		
Professional Engineer's No.		
(PE NUM)		
State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO

WELL SYSTEM UPGRADES

BOLTON ROAD AREA
PIPING AND INSTRUMENTATION DIAGRAM

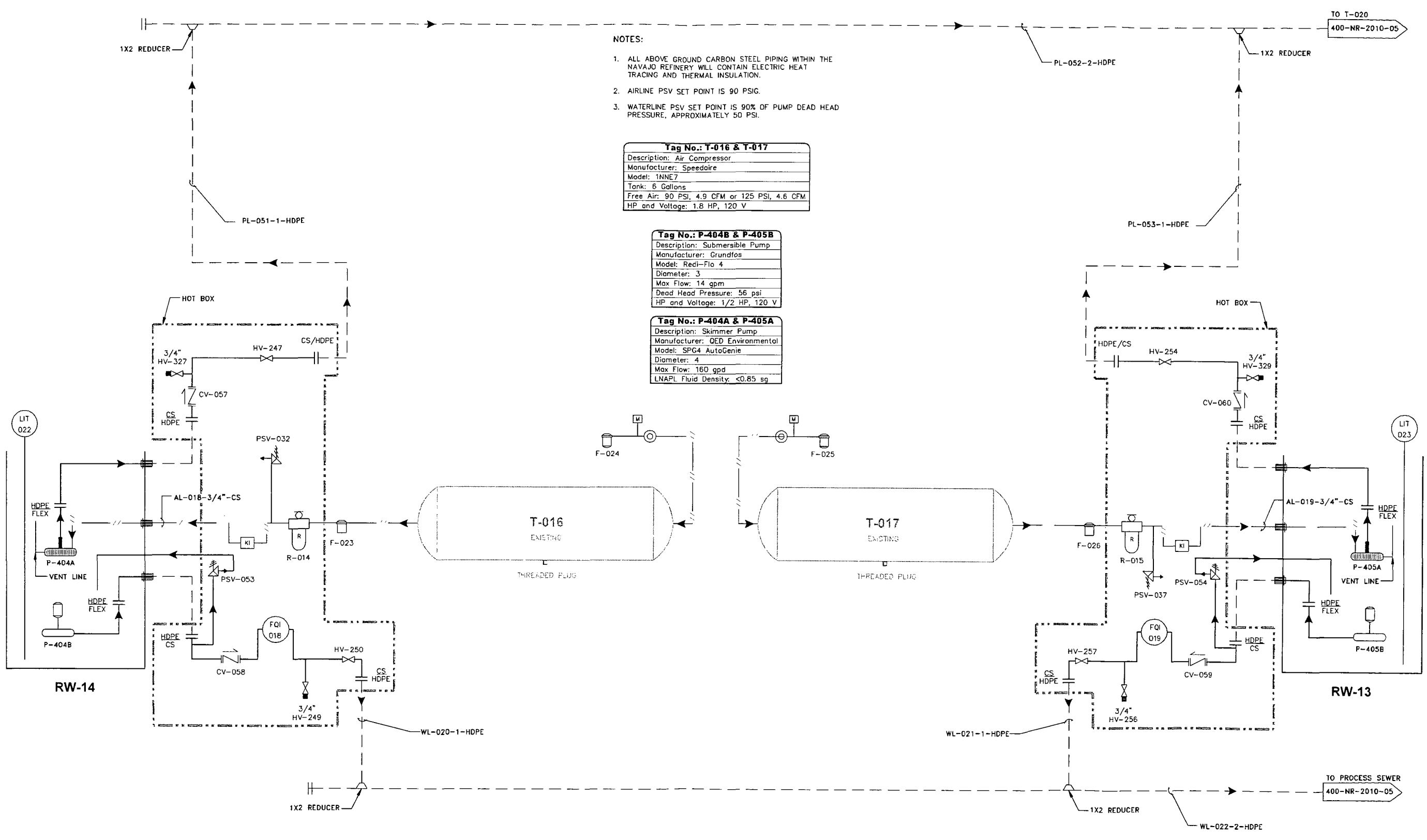
GENERAL

400-NR-2010-02

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE.
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800



NOTES:

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

Tag No.: T-016 & T-017
Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

Tag No.: P-404B & P-405B
Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-404A & P-405A
Description: Skimmer Pump
Manufacturer: QED Environmentol
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

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Professional Engineer's Name		
TIMOTHY WIPPOLD		
Professional Engineer's No.		
(PE NUM)		
State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	.

ARCADIS

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO

WELL SYSTEM UPGRADES

BOLTON ROAD AREA
PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

400-NR-2010-03

ARCADIS Project No. TX000871.0001.00002
Date DECEMBER 2010
ARCADIS 2929 BRIARPARK DRIVE, SUITE 300 HOUSTON, TEXAS 77042 TEL. 713.953.4800

1X2 REDUCER

PL-055-2-HDPE

PL-054-1-HDPE

NOTES: HDPE / CS

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

Tag No.: T-018 & T-019
Description: Air Compressor
Manufacturer: Speedaire
Model: 1NNE7
Tank: 6 Gallons
Free Air: 90 PSI, 4.9 CFM or 125 PSI, 4.6 CFM
HP and Voltage: 1.8 HP, 120 V

Tag No.: P-406B & P-407B
Description: Submersible Pump
Manufacturer: Grundfos
Model: Redi-Flo 4
Diameter: 3
Max Flow: 14 gpm
Dead Head Pressure: 56 psi
HP and Voltage: 1/2 HP, 120 V

Tag No.: P-406A & P-407A
Description: Skimmer Pump
Manufacturer: QED Environmental
Model: SPG4 AutoGenie
Diameter: 4
Max Flow: 160 gpd
LNAPL Fluid Density: <0.85 sg

TO T-021
400-NR-2010-05

1X2 REDUCER
HV-070
3/4" HV-269
PL-057-1-CS
CS HDPE
PL-057-1-HDPE

HOT BOX
HDPE/CS
HV-268
3/4" HV-333
CV-066
CS HDPE
LIT 025
AL-021-3/4"-CS
HDPE FLEX
P-407A
VENT LINE
PSV-056
PSV-043
FQI 021
HV-273
CV-062
HDPE CS
3/4" HV-272
P-407B
RW-15

HOT BOX
HDPE CS/HDPE
HV-261
3/4" HV-331
CV-063
CS HDPE
LIT 024
PSV-038
AL-020-3/4"-CS
HDPE FLEX
P-406A
VENT LINE
PSV-055
KI
R-016
F-027
F-028
F-029
T-018
T-019
THREADED PLUG
THREADED PLUG
F-030
R-017
HDPE FLEX
P-406B
FQI 020
HV-264
CV-064
HDPE CS
3/4" HV-263
KWB-4
WL-023-1-HDPE
WL-024-1-HDPE
3/4" HV-277
HV-078
1X2 REDUCER
HDPE CS
1X2 REDUCER
TO PROCESS SEWER
400-NR-2010-05
WL-025-2-CS

NOT TO SCALE

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TIMOTHY WIPPOLD
Professional Engineer's No.: (PE NUM)

State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	

ARCADIS
ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

BOLTON ROAD AREA
PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

400-NR-2010-04

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

ARCADIS
2926 BRIARPARK DRIVE.
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

FROM RW-15 & KWB-4
400-NR-2010-04

FROM RW-13 & RW-14
400-NR-2010-03

FROM RW-11 & RW-12
400-NR-2010-02

FROM NEW CHASE WELL 1 & NEW CHASE WELL 2
400-NR-2010-01

PL-058-2-HDPE

1" HDPE VENT

LIT 006

1" HDPE OVERFLOW TO SECONDARY CONTAINMENT

T-020
BOLTON ROAD

HDPE / CS

HV-282

MV-007

HV-279

3/4" HV-283

3/4" HV-284

3/4" HV-288

PL-054-2-CS

HDPE CS

CV-075

CV-076

WL-026-2-CS

FROM NEW CHASE WELL 1 & NEW CHASE WELL 2
400-NR-2010-01

FROM RW-11 & RW-12
400-NR-2010-02

FROM RW-13 & RW-14
400-NR-2010-03

FROM RW-15 & KWB-4
400-NR-2010-04

1" HDPE VENT

LIT 007

1" HDPE OVERFLOW TO SECONDARY CONTAINMENT

T-021
SOUTHEAST PLANT

3/4" HV-297

HV-298

MV-008

HV-299

PL-064-2-CS

3/4" HV-303

HV-296

CV-079

3/4" HV-295

PL-065-2-CS

HV-300

3/4" HV-310

CS HDPE

PL-063-2-HDPE

PI 041

3/4" HV-292

HV-291

PL-062-2-CS

P-409B

CV-078

3/4" HV-293

PI 042

3/4" HV-290

HV-289

P-409A

CV-077

3/4" HV-285

PL-061-2-CS

WL-027-2-CS

HV-157

HV-287

FQI 022

TO RW-05
200-NR-2010-01

3/4" HV-304

PI 044

3/4" HV-312

HV-311

PL-068-2-CS

P-410B

CV-082

3/4" HV-313

FQI 023

HV-308

PI 043

3/4" HV-306

HV-305

P-410A

CV-081

3/4" HV-307

PL-067-2-CS

PL-066-2-CS

TO PROCESS SEWER
200-NR-2010-01

Tag No.: T-020 & T-021
Description: Double Wall Vertical Tank
Manufacturer:
Model:
Tank: 500 Gallons
MOC:
Dimensions:

Tag No.: P-410A & B
Description: Centrifugal Pump
Manufacturer: GOULDS
Model: NPE 1ST
Flow: 47 GPM
Dead Head Pressure: 49 psi
HP and Voltage: 1.5HP & 480V

Tag No.: P-409 A & B
Description: Centrifugal Pump
Manufacturer: GOULDS
Model: NPE 1ST
Flow: 47 GPM
Dead Head Pressure: 49 psi
HP and Voltage: 1.5HP & 120V

NOTES:

1. ALL ABOVE GROUND CARBON STEEL PIPING WITHIN THE NAVAJO REFINERY WILL CONTAIN ELECTRIC HEAT TRACING AND THERMAL INSULATION.
2. AIRLINE PSV SET POINT IS 90 PSIG.
3. WATERLINE PSV SET POINT IS 90% OF PUMP DEAD HEAD PRESSURE, APPROXIMATELY 50 PSI.

400-NR-2010-05

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Professional Engineer's Name		
TIMOTHY WIPPOLD		
Professional Engineer's No.		
(PE NUM)		
State	Date Signed	Project Mgr.
NM		DRH
Designed by	Drawn by	Checked by
CR	KLS	.

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

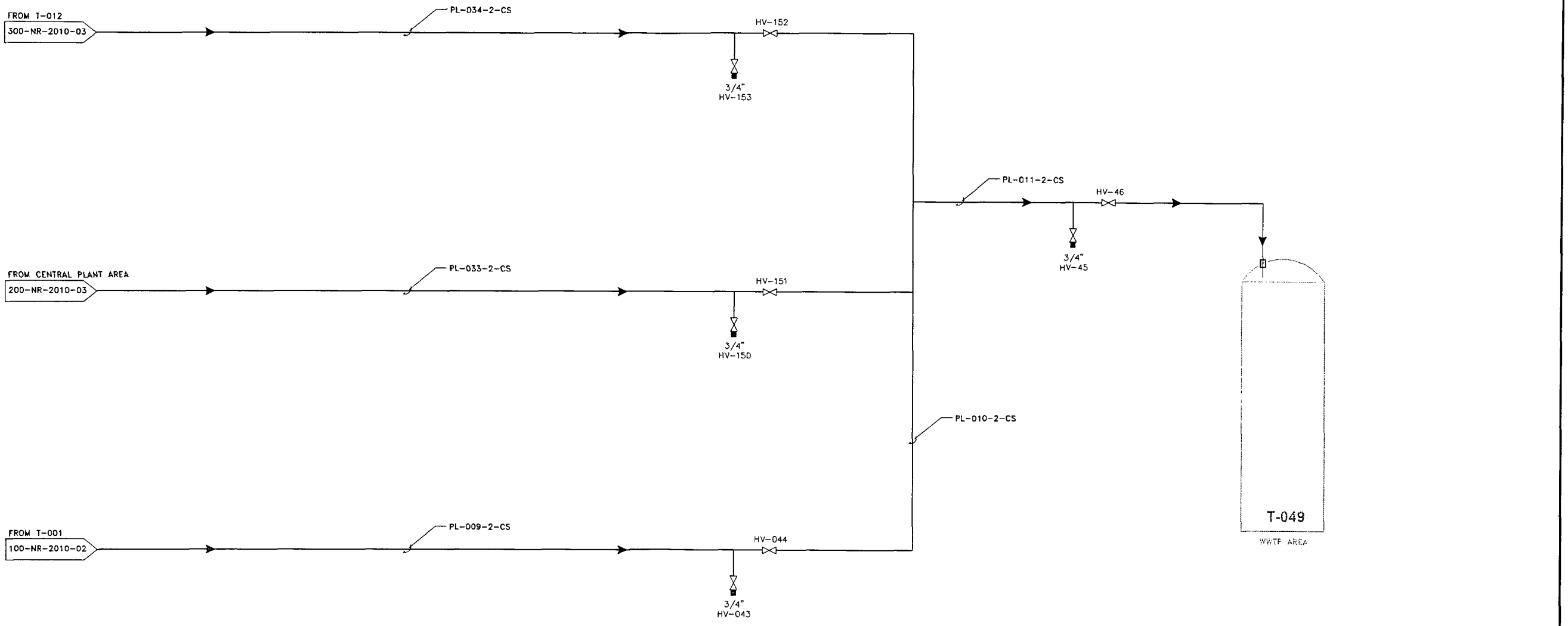
BOLTON ROAD AREA PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

ARCADIS
2929 BRIARPARK DRIVE.
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800



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Professional Engineer's No.: (PE NUM)		
State: NM	Date Signed:	Project Mgr.: DRH
Designed by: CR	Drawn by: KLS	Checked by: .

ARCADIS U.S., INC.

NAVAJO REFINING COMPANY, ARTESIA REFINERY • EDDY COUNTY, NEW MEXICO
WELL SYSTEM UPGRADES

TANK 49
PIPING AND INSTRUMENTATION DIAGRAM

GENERAL

500-NR-2010-01

ARCADIS Project No.
TX000871.0001.00002

Date
DECEMBER 2010

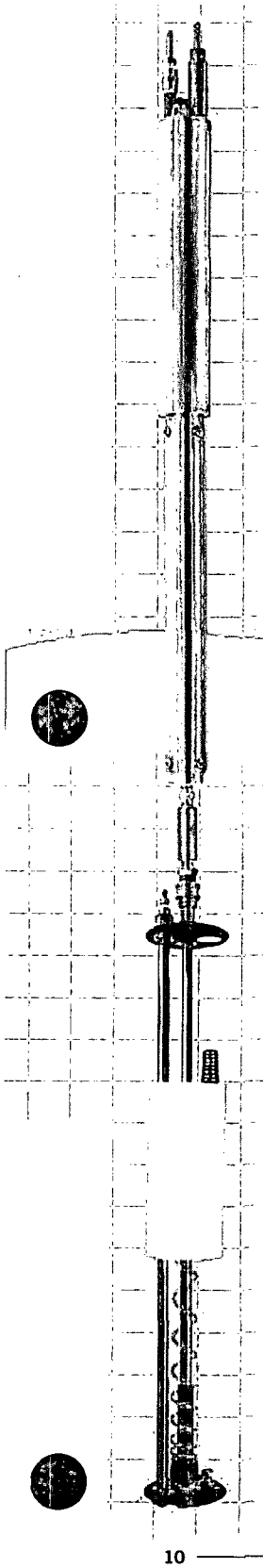
ARCADIS
2929 BRIARPARK DRIVE,
SUITE 300
HOUSTON, TEXAS 77042
TEL. 713.953.4800

ARCADIS

B1

Recovery Well Product Pump

4" SPG4 AutoGenie™



4" SPG AutoGenie™ Skimmers

The 4" SPG4 AutoGenie™ is a safe, reliable and complete system for removing free product layers from wells. The 4" SPG4 AutoGenie system consists of an air-powered pumping unit with a floating inlet that tracks changes in the water level. The SPG float uses specific gravity to avoid water intake and includes multiple inlet hole positions to allow fine-tuning of the inlet level as the floating layer thickness is reduced. The special Genie bladder pump with high suction capacity delivers proven reliability and durability. The AutoGenie uses an integral pneumatic timer to control the bladder pump fill and discharge times. A complete line of matched accessories is available to help installation and performance, including in-well tubing, well caps, LNAPL collection tank full shutoffs and other items.

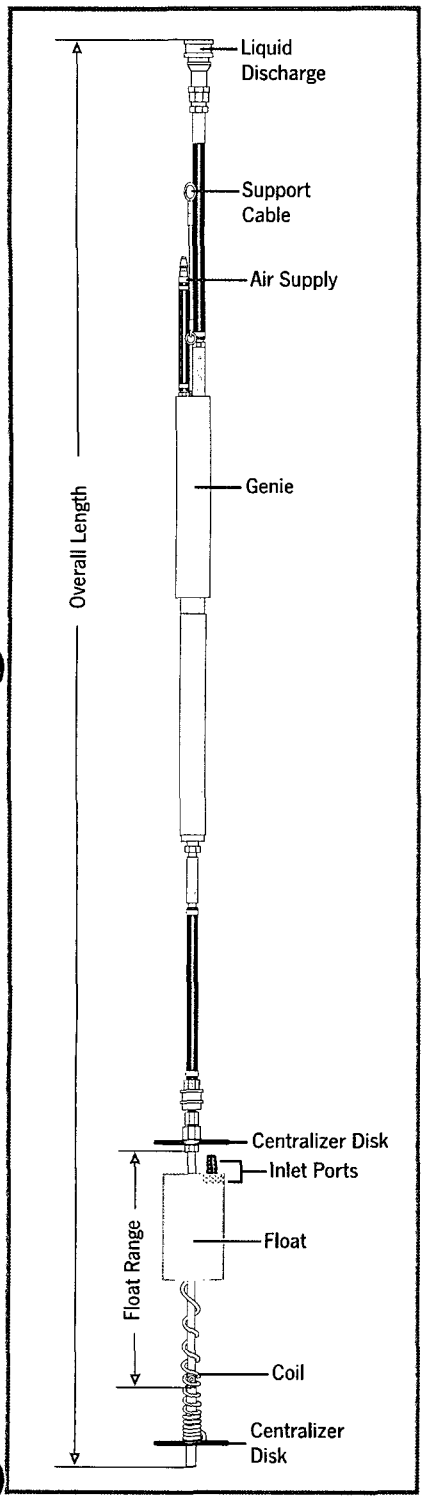
Warranty

SPG4 AutoGenies are warranted for one (1) year.

Advantages

1. **Specialized bladder pump is extremely durable, provides high suction to maintain flow, and eliminate contact of drive air with pumped fluid.**
2. **Continuous, automatic operation that is 100% air powered.**
3. **Available in a range of flow rates and float travel ranges.**
4. **Low air consumption.**

4" SPG4 AutoGenie™



The 4" SPG4 AutoGenie™ is available in 8 different models with varying inlet float travel ranges and pumping rates. Why so many options? QED has found that each free product site and well can have its own challenges in terms of well depth, liquid column depth, water level fluctuation and desired LNAPL pumping rate. For example, the model with the longest pump and float travel range may be too long for some wells. Check the dimensions and flow rates below, or just call QED to help select the best match for your project.

Specifications

AutoGenie Model	Maximum LNAPL Recovery Rate*	Float Travel Range	Overall Length	Minimum Liquid Column
AG2424L SPG4	160 gpd (605 Lpd)	24 in. (61 cm)	124 in. (315 cm)	31 in. (79 cm)
AG2424C SPG4	160 gpd (605 Lpd)	24 in. (61 cm)	109 in. (277 cm)	15 in. (38 cm)
AG2445 SPG4	160 gpd (605 Lpd)	45 in. (114 cm)	129 in. (329 cm)	15 in. (38 cm)
AG2460 SPG4	160 gpd (605 Lpd)	60 in. (152 cm)	145 in. (368 cm)	16 in. (41 cm)
AG4824L SPG4	320 gpd (1,211 Lpd)	24 in. (61 cm)	148 in. (376 cm)	31 in. (79 cm)
AG4824C SPG4	320 gpd (1,211 Lpd)	24 in. (61 cm)	133 in. (338 cm)	15 in. (38 cm)
AG4845 SPG4	320 gpd (1,211 Lpd)	45 in. (114 cm)	153 in. (389 cm)	15 in. (38 cm)
AG4860 SPG4	320 gpd (1,211 Lpd)	60 in. (152 cm)	169 in. (429 cm)	16 in. (41 cm)

Minimum Well ID	4 in. (10 cm)
Maximum OD	3.79 in. (9.63 cm)
Maximum Depth	150 ft. (45.7 m)
Air Supply Pressure (min/max)	40/100 psi (2.7/6.9 bar)
LNAPL Fluid Density	< .85 SG
Kinematic Viscosity	1-1000 centistokes
Recommended Initial LNAPL Layer	> 3 in. (> 7.6 cm)
Residual LNAPL Layer	≥ 0.25 in. (.64 cm)
Suitable Types of LNAPL	Gasoline, diesel, jet fuels, kerosene, #2 - #5 fuel oils, light weight motor oil and hydraulic fluid
Materials	Brass, Tygon®, stainless steel, Viton®, Teflon®
Fitting Type	Quick-connect
Hose or Tubing	Both are available

Tygon is a registered trademark of Saint Gobain - Norton. Viton is registered trademark of DuPont Dow Elastomers.
Teflon is a registered trademark of Dupont.
* gpd = gallons per day, Lpd = liters per day

P.O. Box 3726 Ann Arbor, MI 48106 USA **800-624-2026** **F 734-995-1170** info@qedenv.com www.qedenv.com

ARCADIS

B2

Recovery Well Groundwater Pump

GRUNDFOS®

Redi-Flo4 Environmental Submersible Pumps

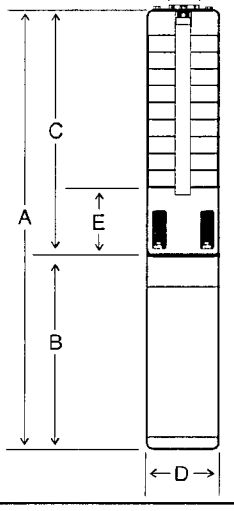
10E

Submittal Data 3450 RPM 60 Hertz

JOB or CUSTOMER:	
ENGINEER:	
CONTRACTOR:	
SUBMITTED BY:	DATE:
APPROVED BY:	DATE:
ORDER NO:	DATE:
SPECIFICATION REF:	

QUANTITY	TAG NO.	MODEL NO.	GPM	FEET	VOLT	PHASE	COMMENTS

Dimensions



Technical Data

FLOW RANGE: 5 to 14 U.S. GPM

MOTORS: Grundfos MS402E Environmental Submersible Motor (Standard)
Maximum Operating Temperature: 104°F (40°C)
Maximum Submergence Pressure: 220 PSI
Maximum Number of Starts Per Hour: 100
Minimum Recommended Flow Past Motor: 0.25 ft./sec.

(NOTE: Franklin Pollution Recovery motor is optional.)

DISCHARGE SIZE: 1 ¼" NPT

MATERIALS OF CONSTRUCTION: See reverse side.

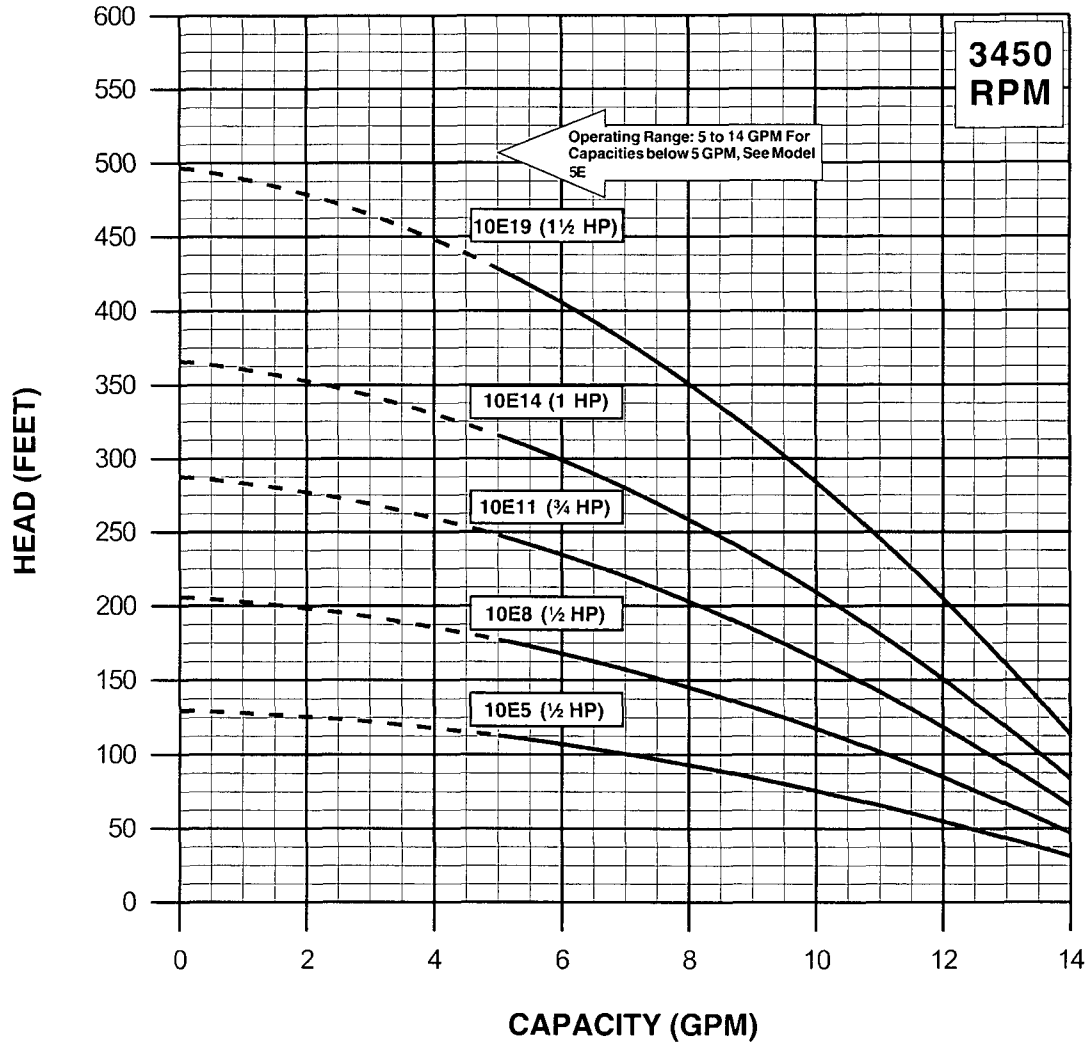
INSTALLATION: Unit to be installed vertically for submerged operation.

Electrical Data, Dimensions, and Weights [1]

Pump Type	Motors				DIMENSIONS IN INCHES							
	HP	SF	PH	Volts	Overall Length A	Motor Length B	Pump End Length C	Max. Dia. D	Inlet E	Disch. Pipe Size (NPT) F	Net Weight (Lbs.)[2]	Ship. Weight (Lbs.)[2]
10E5	½	1.60	1	230	21 1/8	10 13/16	10 5/16	3 31/32	3 ¼	1 ¼	25	26
10E8	½	1.60	1	230	23 9/16	10 13/16	12 ¾	3 31/32	3 ¼	1 ¼	26	28
10E11	¾	1.50	1	230	26 9/16	11 ⅜	15 3/16	3 31/32	3 ¼	1 ¼	28	30
10E14	1	1.40	1	230	29 11/16	12	17 11/16	3 31/32	3 ¼	1 ¼	31	32
10E19	1 ½	1.30	1	230	35 ⅜	13 9/16	21 13/16	3 31/32	3 ¼	1 ¼	35	37

[1] Data for Grundfos MS402E motors. [2] Does not include motor leads.

Performance Curves



Materials of Construction

REDI-FLO4 PUMP END

Description	Material
Check Valve Housing, Check Valve, Diffuser Chamber, Impeller, Suction Interconnector, Inlet Screen, Pump Shaft, Straps, Cable Guard, Priming Inducer	304 SS
Check Valve Seat	304 SS & Teflon®
Impeller Seal Ring	Teflon®
Coupling	316/431 SS
Intermediate Bearings	Teflon®

GRUNDFOS ENVIRONMENTAL MOTOR

Description	Material
NEMA Top, Studs & Fasteners, Stator Housing, Fill Plug Screw	304 SS
Nuts	316 SS
Sand Slinger	FPM
Shaft Extension	431 SS
Diaphragm	FPM
Fill Plug Washer	Teflon®

GRUNDFOS ENVIRONMENTAL MOTOR LEADS

Description	Material
Connector Sleeve	304 SS
Connector Potting	Scotch Cast #4® Epoxy w/FPM Cap
Connector Plug	FPM
Lead Insulation	Teflon®
Conductor	Stranded Copper, 12 AWG

NOTES: Specifications are subject to change without notice.
Teflon® is a registered trademark of DuPont.
Scotch Cast #4® is a registered trademark of 3M Company.

GRUNDFOS®

GRUNDFOS Pumps Corporation • 3131 N. Business Park Ave. Fresno, CA 93727
Customer Service Centers: Allentown, PA • Fresno, CA
Phone: (800)333-1366 • Fax: (800)333-1363
Canada: Oakville, Ontario • **Mexico:** Apodaca, N.L.

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ARCADIS

B3

Pump Station Product Pump
(Refinery)

GOULDS PUMPS

Submittal Data

NPE Stainless Steel
End Suction Stainless Steel Pumps

MODEL : 1ST1F7C4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
47 US g.p.m.	10 US g.p.m.	113 ft	100 ft	5 ft	460V 3PH XP	1ST1F7C4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2011-01-04 Approved by: _____ Date: _____

Engineering Data

Pump Code: 1ST1F7C4
Pump Size: 1 x 1 1/4 - 6
Pump Max Horsepower: 1.5014 hp
Pump Horsepower at Rating Point: 0.74 hp
Pump Shut Off Head: 113 ft
Motor Speed: 3500 rpm
Max. Temperature: 212 °F
Liquid: Water
Motor Code: BBC07875
System Input Power: 3~ 460 V
Motor Rated Horsepower: 1.50 hp
Max. Frequency 60
Electrical Enclosures: XP
Motor Standard: NEMA
Suction Flange Standard: NPT
Suction Flange Rating: 125 PSI
Suction Size: 1 1/4"
Discharge Flange Standard: NPT
Discharge Flange Rating: 125 PSI
Discharge: 1"
Approximate Net Weight: 40 lb
Impeller Size: $5^3/_{16}$"
Impeller Construction: Closed
Impeller Type: Radial impeller
Impeller Material:
AISI 316L Stainless Steel
Sense of Rotation: Clockwise from the drive end
Shaft Seal: Carbon/Sil-Carbide/Viton

Standard Equipment / Capability:

High Efficiency Impeller:
Enclosed impeller with unique floating seal ring design maintains maximum efficiencies over the life of the pump without adjustment.
Mechanical Seal:
Standard John Crane Type 21 with carbon versus silicon-carbide faces, Viton elastomers, and 316 stainless metal parts. Optional high temperature and chemical duty seals available.
Motors:
NEMA standard open drip-proof, totally enclosed fan cooled or explosion proof enclosures. Rugged ball bearing design for continuous duty under all operating conditions.
Superior Materials of Construction:
Complete AISI 316L stainless steel liquid handling components and mounting bracket for corrosion resistance, quality appearance, and improved strength and ductility.
Casing and Adapter Features:
Stainless steel construction with NPT threaded, centerline connections, easily accessible vent, prime and drain connections with stainless steel plugs. Optional seal face vent/flush available.

GOULDS PUMPS

Performance Data

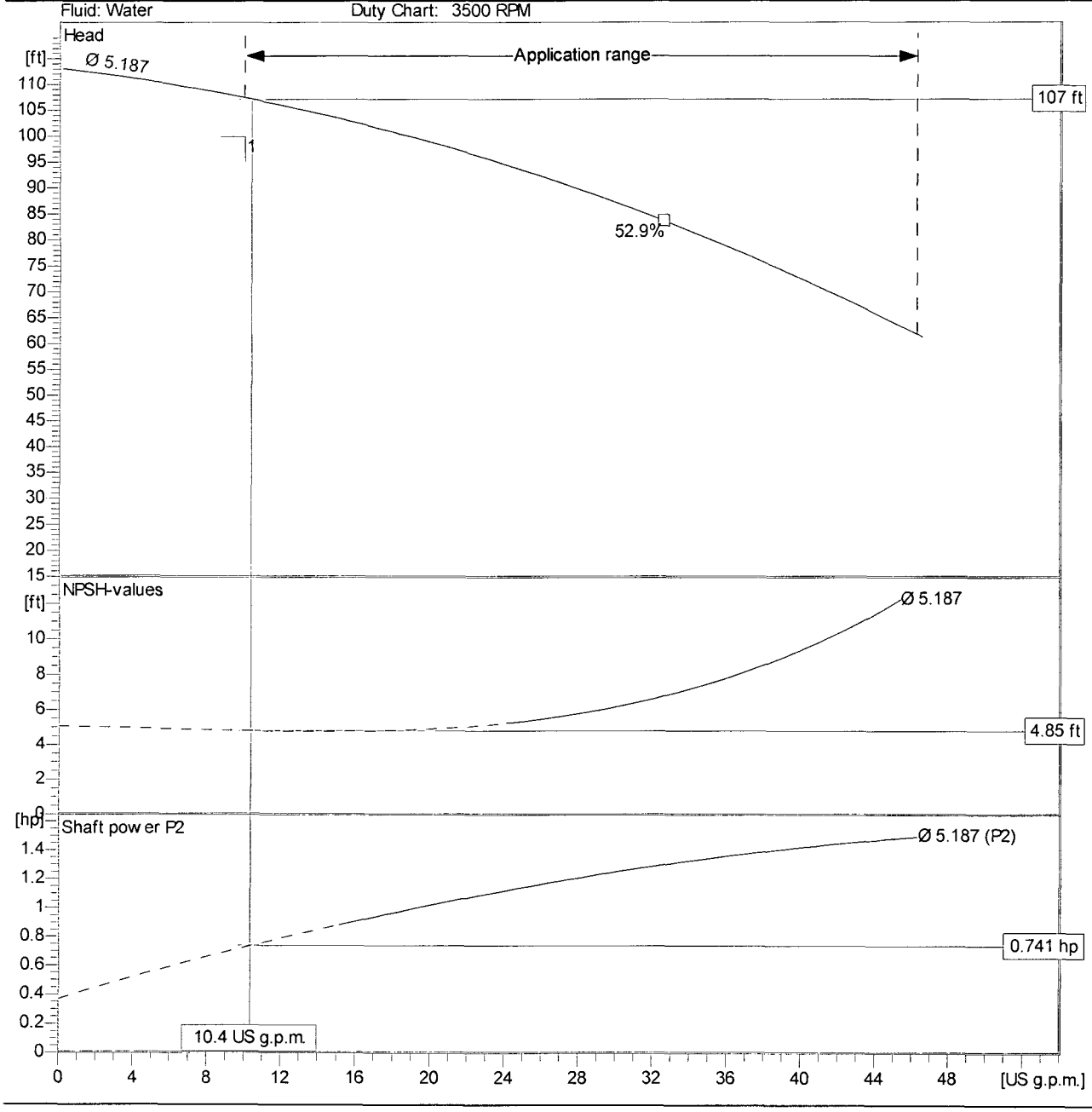
NPE Stainless Steel
End Suction Stainless Steel Pumps

MODEL : 1ST1F7C4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
47 US g.p.m.	10 US g.p.m.	113 ft	100 ft	5 ft	460V 3PH XP	1ST1F7C4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2011-01-04 Approved by: _____ Date: _____

Fluid: Water Duty Chart: 3500 RPM



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2011-01-04

GOULDS PUMPS

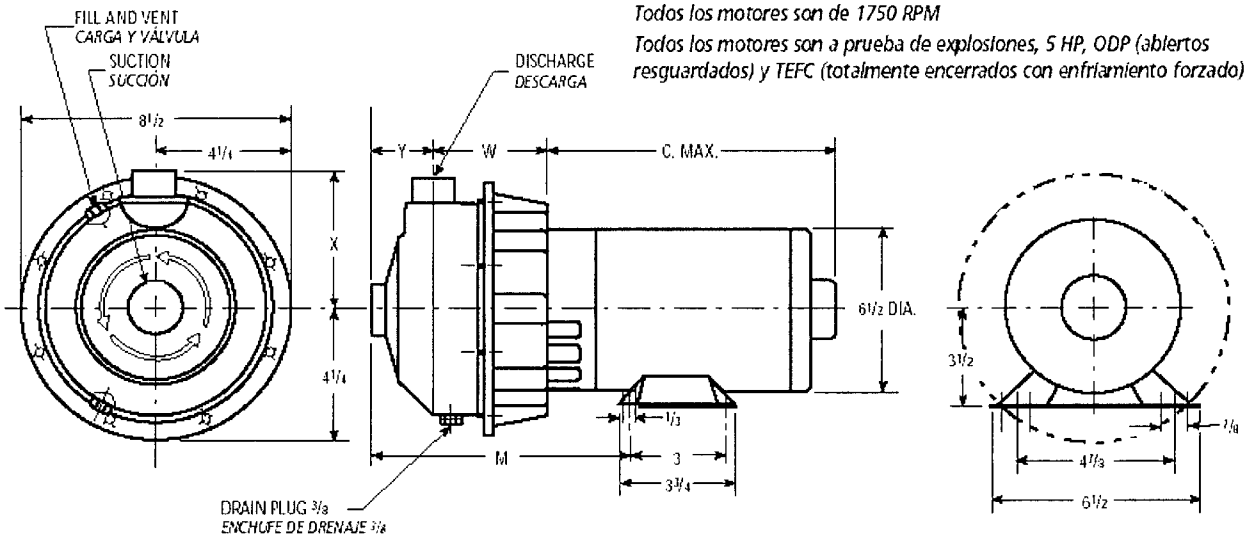
Unit Dimensions

NPE Stainless Steel
End Suction Stainless Steel Pumps
MODEL : 1ST1F7C4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
47 US g.p.m.	10 US g.p.m.	113 ft	100 ft	5 ft	460V 3PH XP	1ST1F7C4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2011-01-04 Approved by: _____ Date: _____

All 1750 RPM Motors
All Explosion Proof Motors and 5 HP ODP and TEFC
Todos los motores son de 1750 RPM
Todos los motores son a prueba de explosiones, 5 HP, ODP (abiertos resguardados) y TEFC (totalmente encerrados con enfriamiento forzado)



Dimension	Value	Dimension	Value
Cmax	$11\frac{5}{16}$		
Discharge	1" NPT		
L	$4\frac{9}{16}$		
M	$7\frac{5}{16}$		
Suction	1.25" NPT		
W	$3\frac{5}{16}$		
X	$4\frac{3}{8}$		
Y	2		

ARCADIS

B4

Pump Station Product Pump
(Bolton Road)

GOULDS PUMPS
Submittal Data

NPE Stainless Steel
End Suction Stainless Steel Pumps
MODEL : 1ST1F0C4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
47 US g.p.m.	0 US g.p.m.	113 ft	0 ft		115V 1PH XP	1ST1F0C4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2010-12-16 Approved by: _____ Date: _____

Engineering Data

Pump Code: 1ST1F0C4
Pump Size: 1 x 1 1/4 - 6
Pump Max Horsepower: 1.5014 hp
Pump Horsepower at Rating Point:
Pump Shut Off Head: 113 ft
Motor Speed: 3450 rpm
Max. Temperature: 212 °F
Liquid: Water, pure
Motor Code: BBC07825
System Input Power: 1~ 115 V
Motor Rated Horsepower: 1.50 hp
Max. Frequency:60
Electrical Enclosures:XP
Motor Standard: NEMA
Suction Flange Standard: NPT
Suction Flange Rating: 125 PSI
Suction Size: 1 1/4"
Discharge Flange Standard:NPT
Discharge Flange Rating: 125 PSI
Discharge:1"
Approximate Net Weight: 52 lb
Impeller Size: $5^3/_{16}$"
Impeller Construction: Closed
Impeller Type: Radial impeller
Impeller Material:
AISI 316L Stainless Steel
Sense of Rotation: Clockwise from the drive end
Shaft Seal: Carbon/Sil-Carbide/Viton

Standard Equipment / Capability:

High Efficiency Impeller:
Enclosed impeller with unique floating seal ring design maintains maximum efficiencies over the life of the pump without adjustment.
Mechanical Seal:
Standard John Crane Type 21 with carbon versus silicon-carbide faces, Viton elastomers, and 316 stainless metal parts. Optional high temperature and chemical duty seals available.
Motors:
NEMA standard open drip-proof, totally enclosed fan cooled or explosion proof enclosures. Rugged ball bearing design for continuous duty under all operating conditions.
Superior Materials of Construction:
Complete AISI 316L stainless steel liquid handling components and mounting bracket for corrosion resistance, quality appearance, and improved strength and ductility.
Casing and Adapter Features:
Stainless steel construction with NPT threaded, centerline connections, easily accessible vent, prime and drain connections with stainless steel plugs. Optional seal face vent/flush available.

GOULDS PUMPS

Performance Data

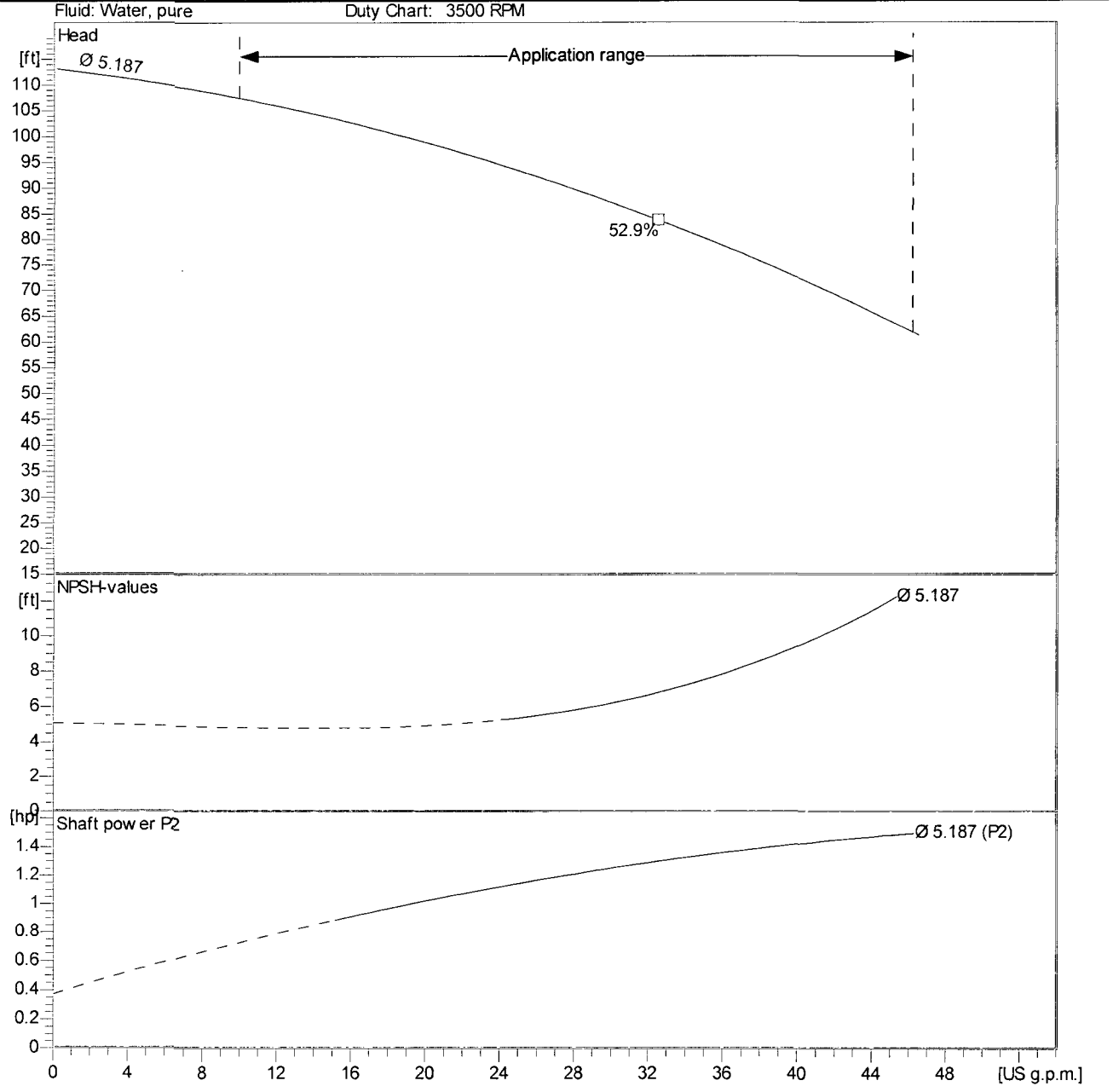
NPE Stainless Steel
End Suction Stainless Steel Pumps

MODEL : 1ST1F0C4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
47 US g.p.m.	0 US g.p.m.	113 ft	0 ft		115V 1PH XP	1ST1F0C4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2010-12-16 Approved by: _____ Date: _____

Fluid: Water, pure Duty Chart: 3500 RPM



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2010-12-16

GOULDS PUMPS

Unit Dimensions

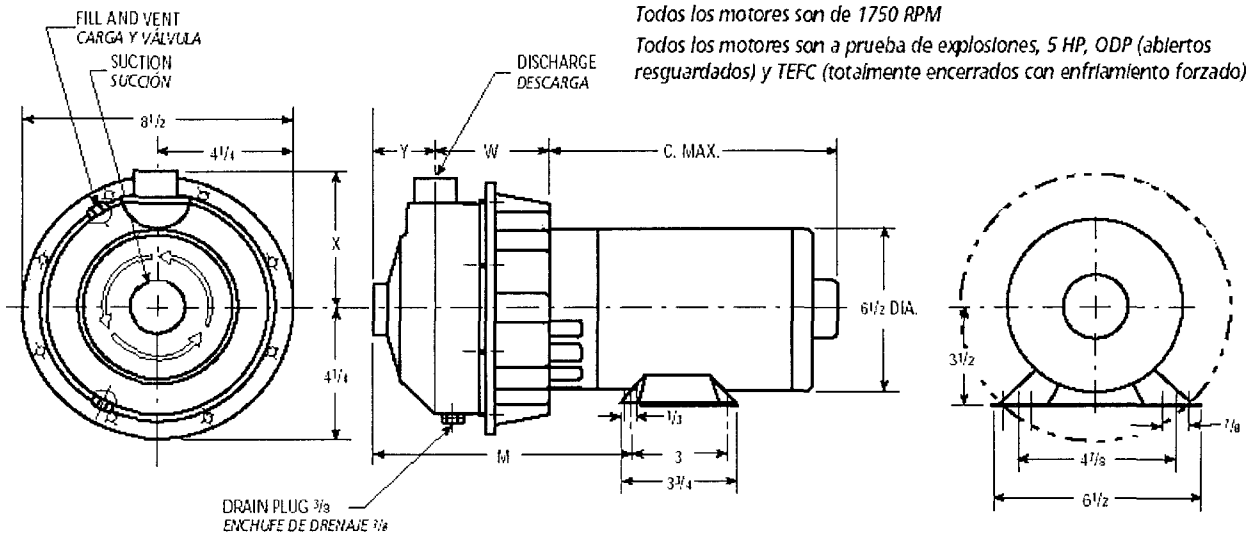
NPE Stainless Steel
End Suction Stainless Steel Pumps

MODEL : 1ST1F0C4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
47 US g.p.m.	0 US g.p.m.	113 ft	0 ft		115V 1PH XP	1ST1F0C4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2010-12-16 Approved by: _____ Date: _____

All 1750 RPM Motors
All Explosion Proof Motors and 5 HP ODP and TEFC
Todos los motores son de 1750 RPM
Todos los motores son a prueba de explosiones, 5 HP, ODP (abiertos resguardados) y TEFC (totalmente encerrados con enfriamiento forzado)



Dimension	Value	Dimension	Value
Cmax	$11^5/_{16}$		
Discharge	1" NPT		
L	$4^9/_{16}$		
M	$7^5/_{16}$		
Suction	1.25" NPT		
W	$3^5/_{16}$		
X	$4^3/_8$		
Y	2		

B5

Pump Station Groundwater Pump

GOULDS PUMPS

Submittal Data

NPE Stainless Steel
End Suction Stainless Steel Pumps

MODEL : 2ST1F7E4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
99 US g.p.m.	0 US g.p.m.	68 ft	0 ft		460V 3PH XP	2ST1F7E4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2010-12-16 Approved by: _____ Date: _____

Engineering Data

Pump Code: 2ST1F7E4
Pump Size: 1 1/4 x 1 1/2 - 6
Pump Max Horsepower: 1.4286 hp
Pump Horsepower at Rating Point:
Pump Shut Off Head: 68 ft
Motor Speed: 3500 rpm
Max. Temperature: 212 °F
Liquid: Water, pure
Motor Code: BBC07875
System Input Power: 3~ 460 V
Motor Rated Horsepower: 1.50 hp
Max. Frequency 60
Electrical Enclosures: XP
Motor Standard: NEMA
Suction Flange Standard: NPT
Suction Flange Rating: 125 PSI
Suction Size: 1 1/2"
Discharge Flange Standard: NPT
Discharge Flange Rating: 125 PSI
Discharge: 1 1/4"
Approximate Net Weight: 40 lb
Impeller Size: 4 1/4"
Impeller Construction: Closed
Impeller Type: Radial impeller
Impeller Material:
AISI 316L Stainless Steel
Sense of Rotation: Clockwise from the drive end
Shaft Seal: Carbon/Sil-Carbide/Viton

Standard Equipment / Capability:

High Efficiency Impeller:
Enclosed impeller with unique floating seal ring design maintains maximum efficiencies over the life of the pump without adjustment.
Mechanical Seal:
Standard John Crane Type 21 with carbon versus silicon-carbide faces, Viton elastomers, and 316 stainless metal parts. Optional high temperature and chemical duty seals available.
Motors:
NEMA standard open drip-proof, totally enclosed fan cooled or explosion proof enclosures. Rugged ball bearing design for continuous duty under all operating conditions.
Superior Materials of Construction:
Complete AISI 316L stainless steel liquid handling components and mounting bracket for corrosion resistance, quality appearance, and improved strength and ductility.
Casing and Adapter Features:
Stainless steel construction with NPT threaded, centerline connections, easily accessible vent, prime and drain connections with stainless steel plugs. Optional seal face vent/flush available.

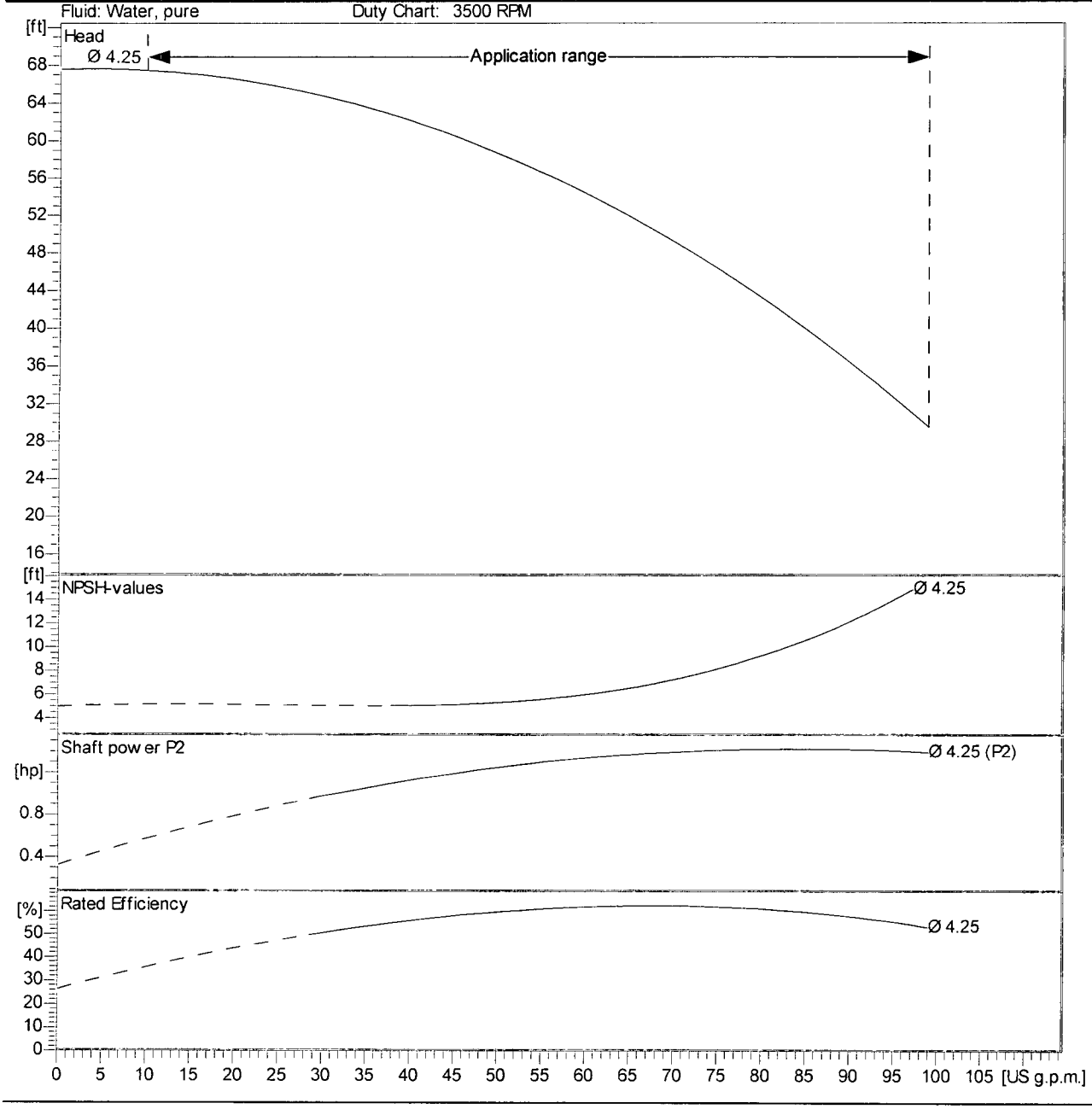
GOULDS PUMPS

Performance Data

NPE Stainless Steel
End Suction Stainless Steel Pumps
MODEL : 2ST1F7E4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
99 US g.p.m.	0 US g.p.m.	68 ft	0 ft		460V 3PH XP	2ST1F7E4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2010-12-16 Approved by: _____ Date: _____



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2010-12-16

GOULDS PUMPS

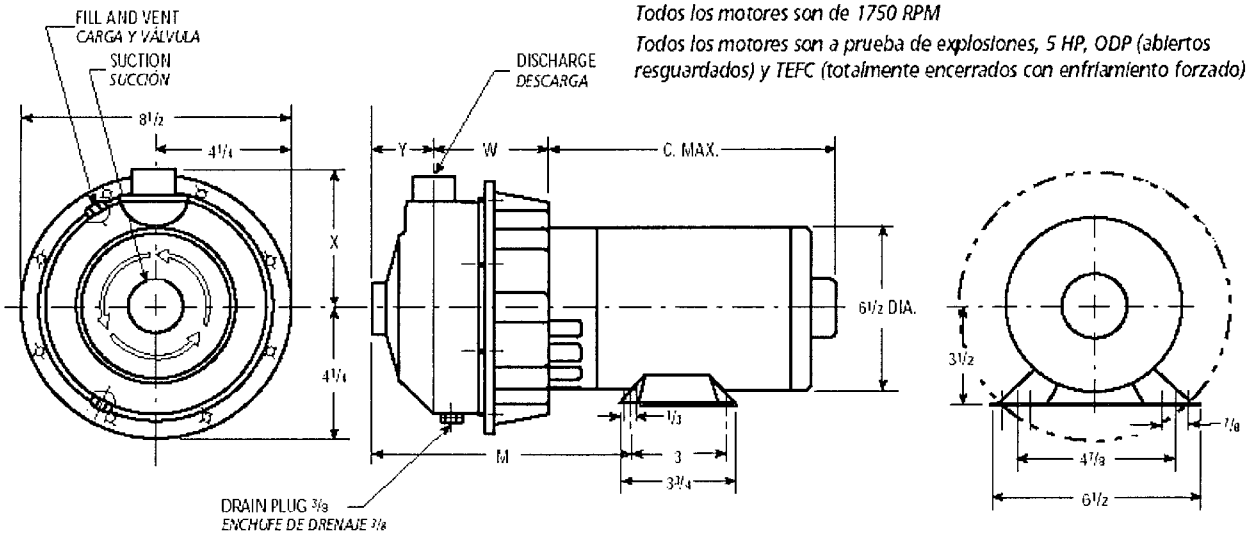
Unit Dimensions

NPE Stainless Steel
End Suction Stainless Steel Pumps
MODEL : 2ST1F7E4

Hydraulic Data					Motor Data	NPE	Qty.
Maximum Flow	Flow at Duty Point	Maximum TDH	TDH at Duty Point	$NPSH_R$	Voltage / Phase / Enclosure	Model	
99 US g.p.m.	0 US g.p.m.	68 ft	0 ft		460V 3PH XP	2ST1F7E4	1

Submittal Prepared for: _____ Job: _____
Engineer: _____ Contractor: _____
Submittal Prepared by: Bowers, Bret Company: _____
Submittal Date: 2010-12-16 Approved by: _____ Date: _____

All 1750 RPM Motors
All Explosion Proof Motors and 5 HP ODP and TEFC
Todos los motores son de 1750 RPM
Todos los motores son a prueba de explosiones, 5 HP, ODP (abiertos resguardados) y TEFC (totalmente encerrados con enfriamiento forzado)



Dimension	Value	Dimension	Value
Cmax	$11^{5}/_{16}$		
Discharge	1.25 NPT		
L	$5^{1}/_{8}$		
M	$7^{7}/_{8}$		
Suction	1.5 NPT		
W	$3^{3}/_{4}$		
X	$4^{1}/_{2}$		
Y	$2^{1}/_{8}$		

Chavez, Carl J, EMNRD

From: Moore, Darrell [Darrell.Moore@hollycorp.com]
Sent: Friday, May 23, 2008 1:52 PM
To: Chavez, Carl J, EMNRD
Attachments: 2008 MW recovery table.xls

Carl:

Attached is a table that shows the current hydrocarbon thickness and approximate volumes removed during recent gaugings. All of the wells, except KWB-8, have shown a significant decrease in the hydrocarbon layer thickness as well as the amount of hydrocarbons that have been able to be removed. Navajo has already purchased a pump to be placed into KWB-8 during the installation of pumps into the Bolton Road recovery wells RW-11's.

Navajo requests that the language in the permit not specify specific wells which currently contain a hydrocarbon layer but more generally any monitoring well containing hydrocarbons. We also request that the method of removal (i.e. mechanical or manual) be left up to Navajo's discretion. Putting an electric pump in most of these wells will be a waste of time and money. The product in them is very sporadic.

If you have any questions please let me know.

Darrell Moore
Environmental Manager for Water and Waste
Navajo Refining Company, L.P.
P.O. Box 159
Artesia, NM 88211-0159
Darrell.moore@navajo-refining.com
phone: 505.746.5281
cell: 505.703.5058
fax: 505.746.5451

MONITORING WELL PRODUCT THICKNESS AND RECOVERY TABLE

	DATE	DEPTH TO PRODUCT (feet)	DEPTH TO WATER (feet)	PRODUCT THICKNESS (feet)	VOLUME REMOVED (~gallons)
KWB-2R	5/21/2008	22.97	23.01	0.04	<0.1
	5/20/2008	22.91	23.00	0.09	<1
	5/19/2008	22.89	23.01	0.12	<1
	5/16/2008	23.03	23.14	0.11	<1
	5/15/2008	23.02	23.22	0.20	<1
	5/14/2008	22.97	23.48	0.51	<1
	5/12/2008	22.86	23.82	0.96	<1
KWB-4	5/21/2008	24.63	26.77	2.14	4.5
	5/20/2008	24.30	27.97	3.67	7
	5/19/2008	24.54	26.75	2.21	6
	5/16/2008	24.76	26.95	2.19	6
	5/15/2008	24.65	27.08	2.43	6
	5/14/2008	24.43	27.67	3.24	6
	5/12/2008	24.23	28.06	3.83	6.5
	5/8/2008	24.30	27.87	3.57	6.5
	5/5/2008	24.45	28.79	4.34	6.5
	5/2/2008	24.64	27.04	2.40	4.5
	5/1/2008	24.09	28.40	4.31	11
KWB-5	5/21/2008	24.57	24.60	0.03	<0.1
	5/20/2008	24.58	24.62	0.04	<0.1
	5/19/2008	24.51	24.53	0.02	<0.5
	5/16/2008	24.62	24.67	0.05	<0.5
	5/15/2008	24.62	24.67	0.05	<0.5
	5/14/2008	24.61	24.66	0.05	<0.5
	5/12/2008	24.52	24.56	0.04	0.5
	5/5/2008	24.56	24.60	0.04	0.5
	5/2/2008	24.58	24.61	0.03	0.5
	5/1/2008	24.45	24.80	0.35	1
KWB-6	5/21/2008	22.86	24.24	1.38	1
	5/20/2008	22.84	24.30	1.46	1
	5/19/2008	22.88	24.35	1.47	1.5
	5/16/2008	22.81	24.41	1.60	2
	5/15/2008	22.86	24.5	1.64	2
	5/12/2008	22.79	25.15	2.36	2.5
	5/8/2008	22.87	25.33	2.46	2.5
	5/5/2008	22.83	25.62	2.79	2.5
	5/2/2008	22.84	25.92	3.08	3.5
	4/29/2008	22.85	25.91	3.06	4
	4/28/2008	22.82	24.41	1.59	4
	4/25/2008	22.95	25.77	2.82	4.5
	4/23/2008	22.90	25.82	2.92	4

	4/15/2008	22.82	25.99	3.17	4
	4/13/2008	23.02	25.48	2.46	6
KWB-8	5/20/2008	24.78	28.83	4.05	15
	5/16/2008	24.85	28.67	3.82	30
	5/15/2008	24.84	28.63	3.79	35
	5/13/2008	24.80	28.65	3.85	155
	5/9/2008	24.80	28.55	3.75	120
	5/6/2008	24.80	28.57	3.77	48
	5/5/2008	24.81	28.59	3.78	20
MW-64	5/21/2008	20.07	22.82	2.75	3
	5/20/2008	20.10	22.86	2.76	4.5
	5/19/2008	20.08	22.21	2.13	5
	5/16/2008	20.20	22.91	2.71	6
	5/15/2008	20.15	22.87	2.72	6.5
	5/14/2008	20.11	22.85	2.74	7
	5/12/2008	20.01	22.83	2.82	7
MW-65	5/21/2008	17.10	17.65	0.55	<0.5
	5/20/2008	17.10	17.21	0.11	1.5
	5/19/2008	17.05	17.48	0.43	2
	5/16/2008	17.11	17.75	0.64	2
	5/15/2008	17.07	17.64	0.57	2
	5/14/2008	17.04	17.53	0.49	2
	5/12/2008	17.00	17.36	0.36	1.5
	5/9/2008	16.95	17.25	0.30	1