GUAM POWER AUTHORITY
ATURIDÅT ILEKTRESEDÅT GUAHAN
P.O. BOX 2977 HAGÅTÑA, GUAM U.S.A. 96932-2977

March 18, 2019

AMENDMENT NO.: XV

TO

INVITATION FOR MULTI-STEP BID NO.: GPA-034-18

FOR

BUILD, OPERATE & TRANSFER CONTRACT FOR 180MW OF NEW GENERATION CAPACITY
STEP 2 – TECHNICAL SPECIFICATIONS

Step 1 Qualified Bidders are hereby notified of the following change and responses to inquiries received from the following:

CHANGE:

1. Amend the following response to an inquiry previously sent:

   QUESTION:

   20. P443 Form 7.2.2 Letter of Commitment
   The RFP states that the letter of commitment should be based on the draft of the Project Agreements (i.e. ECA, Direct Agreement, WSA, LLA). However, only the draft of the ECA seems to be provided with the RFP. As such, would it be sufficient for the letter of commitments to be based only on the draft ECA?

   ANSWER:

   GPA will issue the draft Direct Agreements to the selected Bidder.

Qualified Bidder #1 dated 10/05/2018:

QUESTION:

10. Specification of Natural Gas
There isn't specification of Natural Gas on IFMSB. Even though Natural Gas is used in the future, Assumption of Natural Gas specification is essential for the preparation of bid

ANSWER:

Kindly refer to *ANSWER* for Question #17 of Qualified Bidder #6 in *Amendment No.: XII* dated March 05, 2019.

Qualified Bidder #1 dated 10/19/2018:

QUESTION:

20. Capacity
IFMSB Section C, 2.2.2
The target efficiency for the facility at base load is 45% or greater.

a) Please clarify if 45% based on HHV
b) We understand that 45% is only a target value not a IFMSB requirement. Please Confirm.

ANSWER:

a) Kindly refer to *ANSWER* to Question #6 of Qualified Bidder #5 in *Amendment No.: X* dated January 22, 2019.

b) Confirmed.
** Addressed in *Amendment No.: VI* dated November 27, 2018.

Qualified Bidder #1 dated 11/09/2018:

QUESTION:

55. Similar Design
IFBSB Section B, 3.2.3 Additional General Instructions
-b), iv) For fossil fuel fired components, new and clean dual fuel ULSD and Natural Gas units of similar design that have been in reliable commercial operation for at least three(3) continuous years as of the Bid Date.

Please clarify whether a reciprocating engine model which has been scaled up, with identical technology, from the model having been in reliable commercial operation for at least three(3) continuous years be accepted as "SIMILAR DESIGN" of the IFMSB Section B, 3.2.3, b), iv), clause(Page 59 of 595). Please find the attachment which was already attached to our clarification letter dated 31/10/2018.

ANSWER:

This was addressed in *Amendment No.: IX* dated January 2, 2019.

QUESTION:

56. This was disregarded per the request of Qualified Bidder #1 dated 01/10/2019.

QUESTION:

57. Regulation Performance
    - IFMSB Section C, 2.2.5 Regulation Performance

    The plant shall be capable of performing regulation required for renewable projects on the GPA system. The plant shall be capable of providing regulation of at least 25 MW/minute, up- and down-ramp, with equivalent of 66% of the plant real power capacity online. It shall be clearly stated what the achievable ramp rate is for all valid combinations of generating units online.

    1. Please clarify the meaning of "with equivalent of 66%", whether it means "from 0% up to 66%" or "up- and down-ramp from 66%"

    2. If it is "up- and down-ramp from 66%", please clarify how much the plant real power has to be increased (e.g. up to 100%) or decreased (e.g. down to 0%) with the 25MW/minute ramp rate.

    3. Please clarify the meaning of "All valid combination of generating units online" and if all valid combinations need to comply with the regulation performance of 25MW/min.

    4. Please clarify if bidder can install any secondary technology such as Battery Storage System in order to achieve the requirement.

ANSWER:

    1. The range in which the plant should respond is 66% of the real power capacity that is on line, i.e. if 100 mw is on line then the range is down to zero and up to 66 mw at 25 mw/min.

    2. Kindly refer to *ANSWER* above.

    3. This has been addressed previously. The response for steam turbines is not expected to meet this but the overall response of operating units should meet this requirement.

    4. Yes, BESS may be applied to meet this requirement. See other answers related to use of BESS for spinning reserve and response requirements.

QUESTION:

58. Transient Response
    - IFMSB Section C, 2.2.4 Transient Response

    The governor transient response shall be fast enough such that following a frequency disturbance a change of at least 5% of a single unit's capability shall be achievable within 1 second, and at least 10% of single units capability shall be achievable within 2 seconds following the disturbance.

    If the power plant is in base load operation, there is no more capability of increasing the output. Please clarify even in this condition, each unit needs to increase its output 5% within 1sec and 10% within 2sec.

ANSWER:

Kindly refer to *ANSWER* for Question #25 of Qualified Bidder #3 in *Amendment No.: XI* dated February 05, 2019.

QUESTION:

59. Wastewater Discharge
    - IFMSB Section C, 1.3.4 Wastewater Discharge

    Wastewater discharge will be the responsibility of the Project Company. The Project Company will need to determine wastewater pretreatment quality to meet the requirements of GWA. Sanitary sewer may potentially be discharged to the GWA treatment facility. The Project Company shall be responsible for the wastewater discharge permitting, and any contractual agreements with GWA

    Please clarify if bidder has an alternative option that obtain the permit from related authorities in order to discharge the wastewater to the sea instead of GWA facility. Otherwise please clarify if it is mandatory to discharge wastewater to only GWA facility.

ANSWER:

It is mandatory to discharge wastewater to only GWA Facility.

<u>Qualified Bidder #1 clarification dated 02/12/2019:</u>

QUESTION:

120. Evaluation Model
    - Spinning Reserve in the Evaluation Model (Excel sheet)

    Based on the GPA evaluation model 15 MW spinning reserve is considered for the evaluation. Due to the algorithm used in the model the spinning serve and availability is distracted form the guaranteed capacity calculating the max. dispatchable energy for each year. Therefore the max. plant load is approx. 85% during for the evaluation which is a disadvantage for the new power plant. Considering that the new plant is the most efficient plant in the GPA grid and dispatched at base load most of the time we would propose to install additional generation capacity to satisfy the spinning reserve in addition to the 180 +/- 10% capacity to optimize the plant and provide the most efficient solution to GPA. Please confirm if this solution is acceptable to GPA.

ANSWER:

This was addressed in *Amendment No.: XII* dated March 05, 2019.

QUESTION:

124. Capacity / Spinning reserve
○ Amendment VII page 3 Bidder#1 Question No.3 & GPA Answer 2
The spinning reserve of 15 mw is required for 30 minutes duration.
The bidder requests clarification on this statement. From the evaluation model (it deducts 15 MW from guaranteed capacity to calculated dispatchable capacity) we assumed spinning reserve must be part of the guaranteed capacity 180 MW +/-10%.
However, from the Answer in Amendment VII we understand that the spinning reserve must only be 15 MW for 30 min. In that case a battery system could potentially be used to satisfy this requirement and installed as additional capacity in excess of 180 MW +/-10%. From our point of view this would be a efficient solution and in line with the future dispatch regime (new plant is most efficient plant and dispatched base load; older generation provide back up /spinning reserve and new plant provide instant spinning capacity for 30 min until other generation uploads.

Please clarify if:
a) 15 mw spinning reserve capacity is required for 30 minutes duration
b) if a battery system can be used to satisfy this requirement (this is in line with modern power plant philosophies)
c) spinning reserve can be installed as additional capacity in excess of 180 MW +/-10%.

* If our questions No.120 and No.124 are not clear, please replace No,120 and No.124 with the questions below

1. Revised ECA of the Amendment X added a definition of ESS-Related Capacity which is a portion of Dependable Capacity. In the meantime, it was described that spinning reserve is required 15MW for 30minutes duration in Bidder#1 Question#3 and GPA answer 3 of the Amendment VII. Therefore, it is assumed that ESS-Related Capacity would be 15MW for 30minutes duration as a portion of Dependable Capacity. If this is the case, we assume that FCC Equation as defined in clause 4.3.1.2 of IFMSB Sec.B should be changed incorporating unavailable time of ESS other than 30 minutes duration. Please confirm it.

2-1. Please confirm, if the sum of i) ESS-Related Capacity(15MW for 30minutes duration) and ii) net capacity of Fossil Fuel Fired Component as determined by the mosty recent Dependable Capacity Test turns out to be more than the Contracted Facility Capacity, Dependable Capacity shall be the Contracted Facility Capacity.

2-2. And, since the Facility's ESS is expected to meet the spinning reserve requiremnet as set forth in the IFMSB, it doesn't need to deduct 15MW from Fossil Fuel Fired Component Capacity in the Evaluation Model for the calculation of Generation from New Power Plant(MW). Please confirm this.

ANSWER:

This was addressed in *Amendment No.: XII* dated March 05, 2019.

Qualified Bidder #1 clarification dated 02/21/2019:

QUESTION:

1. Regarding to preparing the bid document (GPA-034-18, we would like to make sure that our understanding on Notary Public is correct.

   As 1) Notary Public and 2) Notary Public in and for the Territory of Guam are both used among Proposal forms, please clarify whether this indicates GPA requires notarization from a notary's office in Guam.

ANSWER:

The documents that require notarized signatures can be also notarized by a Notary Public licensed in the United States or foreign equivalent of a public notary if a non-United States based BIDDER.

Qualified Bidder #1 clarification dated 03/08/2019:

QUESTION:

1. Although I understand that you are very busy, I would appreciate it if you could provide responses which are related with our additional clarification question of #124(#2-2) dated 02/12/19 and the answer (c) of the question #25(a) of Amendment XII dated 03/05/19 as soon as possible.

   * Question #124(2-2) dated 02/12/19

   2-2. And, since the Facility's ESS is expected to meet the spinning reserve requirement as set forth in the IFMSB, it doesn't need to deduct 15MW from Fossil Fuel Fired Component Capacity in the Evaluation Model for the calculation of Generation from New Power Plant (MW).

   ** Amendment XII the answer of Question #25
   c) Energy Storage system-based spinning reserve can be installed as capacity in excess of 180MW +/-10% (i.e., 198Mw)

   Please confirm that GPA should not deduct 15MW from Fossil Fuel Fired Component Capacity in the Evaluation Model for the calculation of Generation from New Power Plant (MW) if Energy Storage system-based spinning reserve can be installed as capacity in excess of 180MW +/-10%(i.e., 198Mw).

ANSWER:

Confirmed. The deduction from the Contacted Capacity to account for spinning reserve will be adjusted downward on a kW per kW of 30-minute storage basis for spinning reserve provided by ESS, provided that such ESS-based spinning reserve has frequency response characteristics equal to or exceeding the frequency response characteristics of spinning reserve based that would have been provided by a generating unit.

Qualified Bidder #3 dated 11/15/2018:

QUESTION:

11. Regarding Form 2, Affidavit by the Bidder (pdf page 425): Paragraph two on page one mentions Attachment 1-A but the list of attachments on the next page refers to "Attachment 2-A: Certificate from Parent Company (pursuant to Form 2, paragraph 2)". Is one of these a typo or does GPA want to see a certificate of authorization from the parent company also, and not just from the bidder company (i.e., the special purpose company)? And is the certificate supposed to evidence the signatory's authority to give the affidavit, etc. or is it perhaps supposed to be a certificate for something else, e.g., a certificate of incorporation?

ANSWER:

Signatory's authority to give the affidavit.

Qualified Bidder #3 clarification dated 02/12/2019:

QUESTION:

1. We're working on the proposal and two questions have been raised.

   Section 4.10 of the Instructions to Bidders says (on IFB page 74) that "… each sheet [of the Proposal] shall be stamped and initialed by a person or persons duly authorized to sign for the Bidder…" We're trying to understand the purpose of this requirement given that the proposal will be delivered in sealed boxes that will each include a signed and notarized Proposal Letter (Form 1). Also, we're going to be submitting seven proposals (original and copies), each of which will include hundreds of pages of letters, forms, specifications, diagrams, drawings, brochures, etc. We respectfully request that GPA eliminate the requirement to stamp and initial each sheet in the proposal.

   The template for the Major Shareholders Affidavit (on IFB page 485) seems to suggest that the major shareholder(s) signing the affidavit must travel to Guam and sign in the presence of a Guam notary. However, the requirements for the affidavit, which are provided on IFB page 484, don't specify a Guam notary. From our perspective it would be both unusual and inconvenient to require that major shareholders travel all the way to Guam simply to sign an affidavit. Would GPA please reconsider?

ANSWER:

a. All financial form pages submittals in Envelope I, II and III should be stamped and signed. The rest of the proposal will not need to be stamped and signed.

b. The documents that require notarized signatures can be also notarized by a Notary Public licensed in the United States or foreign equivalent of a public notary if a non-United States based BIDDER.

Qualified Bidder #5 dated 10/12/2018:

QUESTION:

2. Section C, Appendix B, Section 1.2; Page Number 195
   A new marine LNG receipt and storage facility will be constructed by Others at the Peterra Facility. Project Company shall assume sufficient storage and supply will be available to support natural gas demand at the Facility. Project Company is responsible for natural gas system beginning at a flange between LNG storage and Project Company's regasification facility.

   Please provide Natural Gas Specification
   A common basis of design for natural gas is required to set performance capacities (contracted and dependable) and reduced assumptions among bidders.
   - Composition including HHV, Temperature, Pressure at terminal point, etc.

ANSWER:

Kindly refer to *ANSWER* for Question #17 of Qualified Bidder #6 in *Amendment No.: XII* dated March 05, 2019.

Qualified Bidder #5 dated 10/19/2018:

QUESTION:

42. Section C, 3.2 subsection 6&7; Page Number 116
    6. Power revenue metering requirements (accuracy class, number of tariffs that can be programmed in the metering system, data logging and storage requirements, software for remote billing requirements, etc.).
    7. Information and requirements for the Electrical Interconnection Facilities (voltage level and location of the GPA substation to be used to for power evacuation, one-line diagram and layout of the substation, specifying whether it is single or double circuit).

    Please provide detailed requirements, such as:
    1) What is the required accuracy class?
    2) What is the requirement for number of tariffs that can be programmed in the metering system?
    3) What are the data logging and storage requirements?
    4) What are the software requirements for remote billing?

ANSWER:

Kindly refer to *ANSWER* for Question #15 of Qualified Bidder #5 in *Amendment No.: XI* dated February 05, 2019.

QUESTION:

43. Section C, 3.3.2; Page Number 131
Civil Studies need to include a "GWA water system model"

Please clarify what a GWA water system model is.

ANSWER:

Kindly refer to *ANSWER* for Question #16 of Qualified Bidder #5 in *Amendment No.: XI* dated February 05, 2019.

QUESTION:

46. Section C, 3.4.9, B.1; Page Number 140
1. All steel shall be shop primed. Finish color will be selected by owner.

For the avoidance of doubt, please clarify the reference to "owner". Is this the Project Company or GPA?

ANSWER:

Kindly refer to *ANSWER* for Question #17 of Qualified Bidder #5 in *Amendment No.: XI* dated February 05, 2019.

<u>Qualified Bidder #5 dated 11/20/2018:</u>

QUESTION:

11. Environmental Studies, Pre-Award
Section D, 8.10 Environmental Data, Page Number 466
Answer the questions below or attach a detailed environmental impact study that includes answers to at least the following questions

What type of detailed environmental impact study does GPA anticipate bidders would complete at this point in the bid process (prior to award of contract)?

Does GPA anticipate that National Environmental Protection Agency (NEPA) documentation would be needed for any of the federal permits?

ANSWER:

a. No environmental impact study is required prior to award of contract.

** Addressed in *Amendment No.: X* dated January 22, 2019.

b. NEPA documentation is not anticipated to be required.

Qualified Bidder #5 clarification dated 03/04/2019:

QUESTION:

1. Biological Survey Report
   Attachment to Amendment 11
   Has the methodology, survey protocol, and findings of the Biological Field Survey (January 2019) completed by EA Engineering been reviewed by the regulatory agencies with jurisdiction over these resources? Have these agencies (e.g. USFWS and Department of Agriculture) concurred with the findings?

ANSWER:

GPA's contractor was not authorized to communicate with any regulatory agencies. However, the methods used for the survey were consistent with those used for similar surveys for the same species throughout Guam. For those similar surveys, methods were developed after coordination with the relevant regulatory agencies. GPA's contractor has not shared the results of the survey with anyone other than GPA.

QUESTION:

2. Biological Survey Report
   Attachment to Amendment 11
   1) The Biological Survey makes an implicit assumption that there is no seasonal variation for any species on the site, please clarify if our understanding is correct and the survey period was appropriate for the species in question.
   2) The report doesn't provide any information about the presence or absence of Guam-listed species (other than the federally listed species). Please clarify if the survey on this missing information has been done or not.
   3) The Biological Survey doesn't mention if any surveys for wetlands or waters of the US were completed for the site. Please clarify if the survey on wetlands and waters has been done as a part of biological survey.

ANSWER:

1) Your understanding is correct, there is no seasonal variation in target species that would facilitate field identification.

2) GPA's contractor conducted a plant and wildlife survey to document species that were observed within the project site, including Guam and federally-listed rare, threatened, and endangered species. The focus of the survey was to document species that were observed, not to document species not observed.

3) As a separate task, a wetland survey was completed in accordance with the criteria established in the United States Army Corps of Engineers (USACE) Wetlands Delineation Manual (1987 Delineation Manual), Technical Report Y-87-1, and the 2012 Regional Supplement to the USACE Wetland Delineation Manual: Hawaii and Pacific Islands Region (2012 Regional Supplement). We are in the process of obtaining concurrence from USACE that there are no areas that meet the definition of jurisdictional wetlands on the site.

QUESTION:

4. Permit
   Has GPA coordinated about the project with any federal agencies through which the pipeline extends (i.e. agencies having jurisdiction over the right-of-way for the pipeline)? E.g. Department of Defense

ANSWER:

Yes. We have requested for Navy's approval to use existing pipeline easement.

QUESTION:

5. Permit
   Has GPA completed any surveys of the pipeline right-of-way including biological and wetland surveys, and cultural resource surveys?

ANSWER:

GPA did an Environmental Baseline Survey in 2006 for the portion of the pipeline easement in Tiyan. Refer to attached report - EBS Report (Final).pdf. Please note that portion of the pipeline easement goes through wetlands in Sinajana, Chalan Pago and Toto villages and one area where endangered species have been sighted (Agana Swamp).

<u>Qualified Bidder #5 clarification dated 02/21/2019:</u>

QUESTION:

2. Fuel Cost Allocation (When Operating Synchronize Condenser)
   ECA; Page Number 540
   The Project Company shall be responsible for the cost of any Fuel consumed in excess of the quantity of Fuel that should have been required to produce the applicable amount of Net Energy Output had the Facility operated in compliance with the Guaranteed Heat Rate as adjusted to the operating parameters provided in the applicable Dispatch Instructions.

   During operation of synchronous condenser, due to increase in aux. load consumption, net heat rate will be increased and possibly exceeding the guaranteed net heat rate. In this case, bidder expects that incremental fuel consumption due to operation of synchronous condenser shall be deducted reasonably from the total fuel charge that the project company is responsible for. Please confirm.

ANSWER:

Increase in auxiliary power consumption due to operation of synchronous condenser will be recovered via Synchronous Condenser Variable O&M charge that should be quoted by Bidders in Table 15.14 of Section D of IFMSB.

QUESTION:

3. Availability for Synchronous Condenser
   Amendment 9
   Amendment 9, page. 4,
   The Synchronous condenser shall have availability of 90% or more. Facility availability guarantee is considered in the evaluation model by assuming that the existing GPA plants will have to generate electricity during the time when the Facility is not available.

   Please clarify the meaning of requirement of 90% of availability for synchronous condenser.
   Is there a formula for calculating the availability of synchronous condenser that the bidder can refer to and make sure that the bid complies with the requirement?

ANSWER:

NERC GADS availability formulas will be applied.

<u>Qualified Bidder #6 dated 12/18/2018:</u>

QUESTION:

7. Section B / P59 3.2.3 Additional General Instructions b) ii)
   We kindly ask for details of the Harmon 115 kV substation (existing substation) to which the project company has to connect and expand with one bay:

   1. Maker and year of commissioning
   2. Single and three line diagrams together with detailed electrical and mechanical drawings.
   3. Datasheets, relay study, ct/vt calculations if any.
   4. Exact point of connection/expansion with one bay.
   5. Protection scheme.
   6. The Short circuit level for the grid.
   7. Allocated space for the bay expansion of the existing Harmon substation.

ANSWER:

1. GPA completed the 115 KV Harmon Substation Expansion in 2004, it was designed by local A/E engineer consultants led by EMC2, Inc. and constructed by Sumitomo Construction Co., Ltd. The 115/34.5 kV substation control and relay equipment were provided by Metro Supplies Company, Inc.
2. Refer to the attached pdf document - Harmon 115 kV Substation Expansion.pdf for the line diagrams. Electrical and Mechanical drawings are not readily available will be made available at a later time to the selected bidder.

3. Refer to the attached pdf document – Datasheets 031519.pdf for datasheets. No relay study or ct/vt calculations are available.
4. This information is not readily available but will be made available at a later time to the selected bidder.
5. This information is not readily available but will be made available at a later time to the selected bidder.
6. Refer to the attached document - Harmon 115 kV Short Curcuit.txt
7. This information is not readily available but will be made available at a later time to the selected bidder.

QUESTION:

8. Section B / P59 3.2.3 Additional General Instructions b) xv)
   The IFSMB states design and construction of the ULSD supply pipeline are coordinated with appropriate Guam entities and authorities and are in compliance with applicable environmental regulations.
   Is the existing pipeline supported by stakes? And when the bidder have to dig to remove them, should the bidder comply with MEC (munitions of explosive concern)?

ANSWER:

No, the existing pipeline is not supported by stakes. The underground sections can be located by tracing the manholes.

** Addressed in ***Amendment No.: XIII*** dated March 15, 2019.

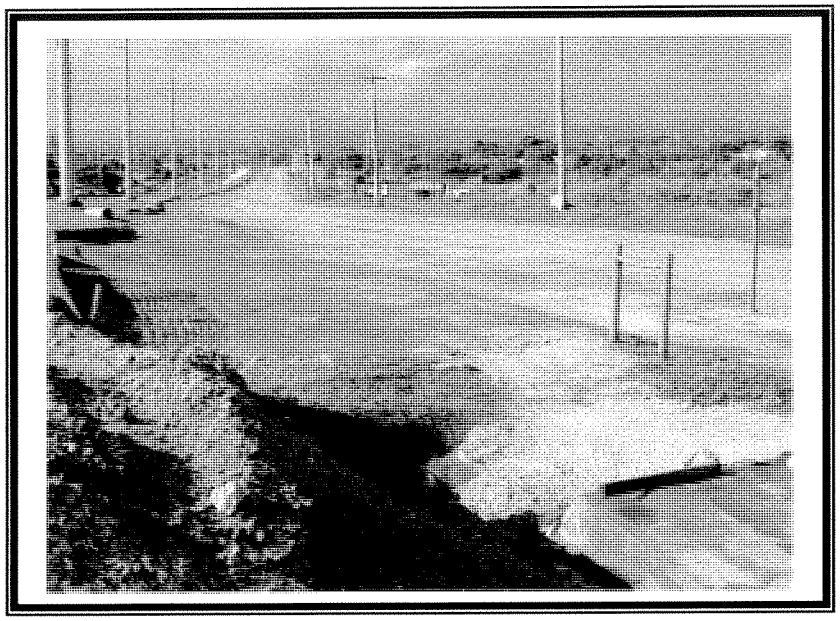
GPA has been informed via Navy Regional Community Plans Liaison Officer that projects not involving DoD money or activity, including those within DoD easements, do not require MEC. This project does not involve DoD money or activity.

All other Terms and Conditions in the bid package shall remain unchanged and in full force.

JOHN M. BENAVENTE, P.E.
General Manager

EBS REPORT

PHASE I ENVIRONMENTAL BASELINE SURVEY
GPA Underground Fuel Oil Pipeline Project
Tiyan
POL Easement (AJKU-EASEMENT-07-1)



Submitted by:

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December 4, 2006

PHASE I ENVIRONMENTAL BASELINE SURVEY
GPA UNDERGROUND FUEL OIL PIPELINE PROJECT
TIYAN

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List of Acronyms

AAFB	Andersen Air Force Base
AST	Aboveground Storage Tank
ACM	Asbestos Containing Material
BOSP	Bureau of Statistics and Plans
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980 (as amended, 42 USC §9601 *et seq.*)
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CES	Civil Engineering Squadron
CFR	Code of Federal Regulations
CORRACTS	Facilities subject to Corrective Action under RCRA
DERP	Defense Environmental Restoration Program
DESMOA	Defense State Memorandum of Agreement
EBS	Environmental Baseline Survey
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act (also known as SARA Title III), 42 USC §11001 *et seq.*)
ERNS	Emergency Response Notification System
ESA	Environmental Site Assessment
FISC	Fleet Industrial Supply Center
FOIA	U.S. Freedom of Information Act (5 USC 552 *et seq.*)
FOSL	Finding of Suitability to Lease
FR	Federal Register
FUDS	Formerly Used Defense Sites
GCA	Guam Code Annotated
GEPA	Guam Environmental Protection Agency
GIAA	Guam International Airport Authority
GPA	Guam Power Authority
GWA	Guam Waterworks Authority
IRP	Installation Restoration Program
LBP	Lead-based Paint
LUST	Leaking Underground Storage Tank
MARC	Micronesian Area Research Center
MSDS	Material Safety Data Sheet
NAS	Naval Air Station
NAVFAC	Naval Facilities
NAVSUP	Naval Supply
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NFRAP	Former CERCLIS sites where no further remedial action is planned under CERCLA
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	National Response Center

PCBs	Polychlorinated Biphenyls
POI	Point of Interest
POL	Petroleum, Oil, Lubricant
PRP	Potentially Responsible Party (pursuant to CERCLA 42 USC §6901 *et seq.*)
RFO	Refined Fuel Oil
RCRA	Resource Conservation and Recovery Act (as amended, 42 USC §6901 *et seq.*)
SARA	Superfund Amendments and Reauthorization Act of 1986 (amendment to CERCLA)
TSDF	Hazardous Waste Treatment, Storage, or Disposal Facility
USC	United States Code
USGS	United States Geological Survey
UST	Underground Storage Tank

Executive Summary

ARC Environmental Services was contracted to conduct a Phase I Environmental Baseline Survey for a 3,934 LF segment of US Air Force POL easement (AJKU-EASEMENT-07-1) located at Tiyan, Guam (subject easement). This survey was conducted in accordance with Air Force Instruction (AFI) 32-7066. Survey activities commenced on November 6, 2006. A field inspection was conducted on November 14, 2006. All research activities were completed by December 4, 2006.

This purpose of this survey was to facilitate the establishment of a license agreement between the US Air Force and the Guam Power Authority (GPA) for co-location of new pipeline facilities. This agreement will allow GPA to continue to use the subject easement for fuel oil delivery through a new 8-inch underground pipe line, to the Tanguisson Power Plant.

Data collected during research efforts, interviews and during the site reconnaissance visits identified records of two (2) spills or releases of RFO No. 6 within the subject easement. These releases occurred at the same location, at the intersection of Rt. 16 and the US Main Facility Post Office in Barrigada. The subject easement is therefore classified as follows:

1.) Entire subject easement extending from the Route 10-8-16 Intersection up to, but not including the area near the US Post Office impacted by RFO No. 6 releases, are classified as Category 2.

> *Category 2*
> *Areas where only storage of hazardous substances or petroleum products has occurred (but no releases, disposal, or migration from adjacent areas has occurred)*

2.) The immediate area near the US Post Office impacted by the September 2006 RFO No. 6 releases is considered Category 4.

> *Category 4*
> *Areas where storage and/or releases, disposal, migration of hazardous substances or petroleum products has occurred, and all removal or remedial actions to protect human health and the environment have been taken.*

No other relevant information was obtained during the survey efforts that identified the presence of hazardous materials/substances or petroleum products contamination, spills, disposal or releases along the subject easement.

1.0 PURPOSE OF THE ENVIRONMENTAL BASELINE SURVEY

This Phase I Environmental Baseline Survey (EBS) was commissioned to investigate the environmental condition of a US Air Force easement referred to as AJKU-EASEMENT-07-1 (subject easement). In particular, this survey is intended to establish the suitability of the subject easement for lease purposes pursuant to CERCLA.

1.1 Boundaries of the Property and Survey Area

The subject easement is located entirely on Tiyan or what was Naval Air Station Agana. It comprises a total of 3,934 linear feet and contains two (2) underground pipelines which are situated between Perimeter Road and Route 16 (see Figure 1). This easement is a minor segment of a much longer POL corridor that extends between Piti Village and both the Tanguisson Power Plant and Andersen Air Force Base in Yigo. Figure 2 depicts the approximate limits of this EBS.

1.2 Background

At the conclusion of World War II, the Tiyan area of Guam was developed as a US Naval Air Station. In 1953, the first aboveground pipeline facilities were established along the current alignment to meet fuel needs for the US Navy and Air Force. In 1995, NAS Agana was operationally closed. In 1996, the US Navy turned over its power generation plants and transmission and distribution facility assets, including associated fuel delivery pipelines, to the Guam Power authority via a lease agreement. In 2000, NAS Agana was transferred to the Government of Guam, the GIAA and various Federal agencies.

The process of disposition, transfer and/or leasing of US Department of Defense assets involved a comprehensive investigation and cleanup of contaminated areas as required under two programs; CERCLA and the Defense Environmental Restoration Program (DERP). Suitability for transfer or lease, was established according to the environmental condition of the property and the proposed reuse of such property. The subject easement was proposed for continued industrial use to deliver fuel oil to GPA and aviation fuel the Air Force.

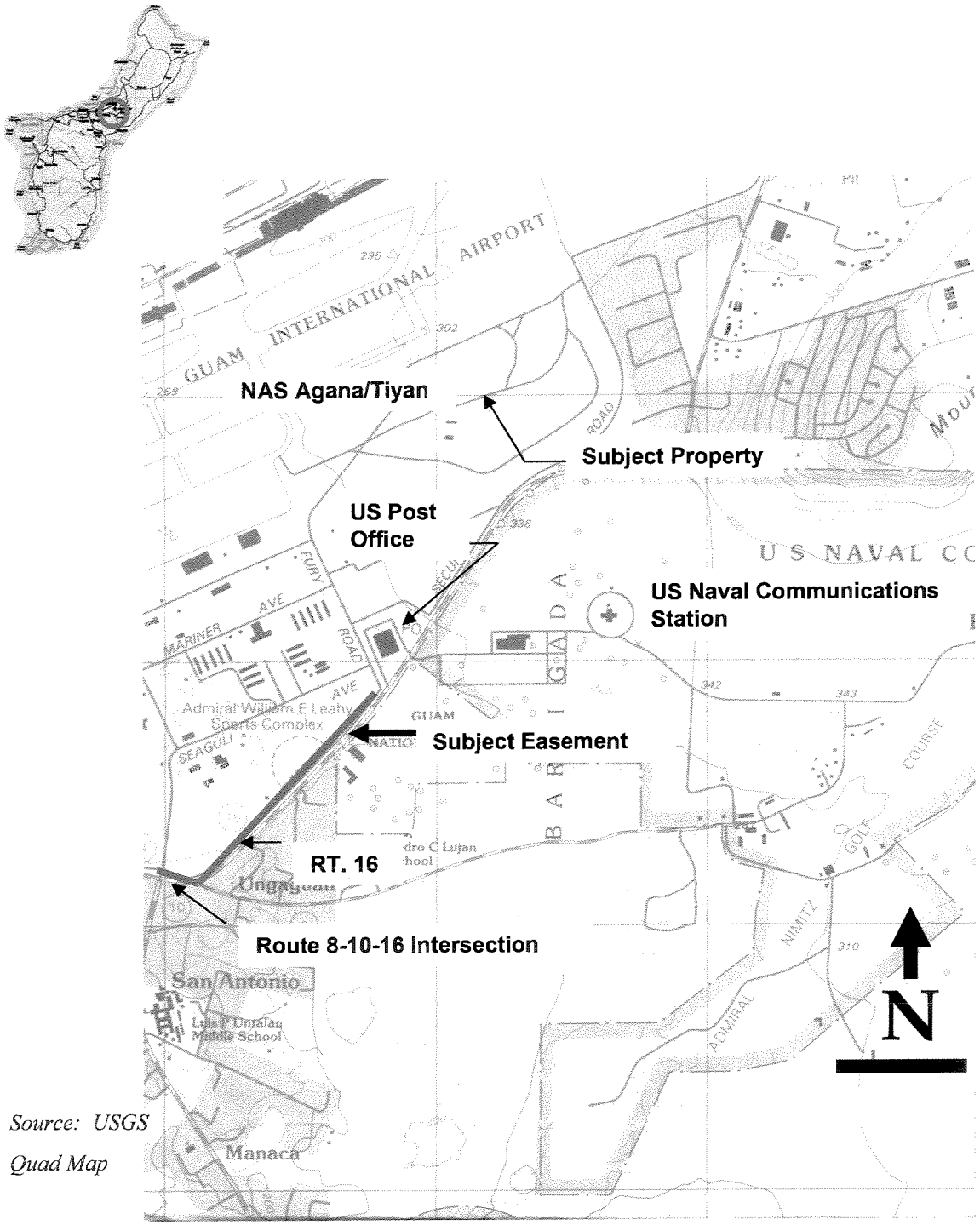
2.0 SURVEY METHODOLOGY

2.1 Approach and Rationale

ARC Environmental Services was contracted to conduct a Phase I EBS for the subject easement corridor using a combination of historical research, personal interviews, site observations, and database records research to develop an understanding of the environmental history and current condition of the subject easement. The following list includes the primary tasks associated with this effort:

1. Regulatory Database and Records Research – Federal Government
2. Regulatory Database and Records Research – Local Government
3. Personal Interviews
4. Map, Aerial Photograph and Archival Research and Review
5. Site Reconnaissance and Data Collection
6. Report Generation

This EBS relies heavily upon the documents listed below. These documents represent a valuable record of recognized environmental conditions within the former NAS Agana now referred to as Tiyan. They provide a thorough review of known environmental issues throughout NAS Agana and U.S. Navy utility assets.



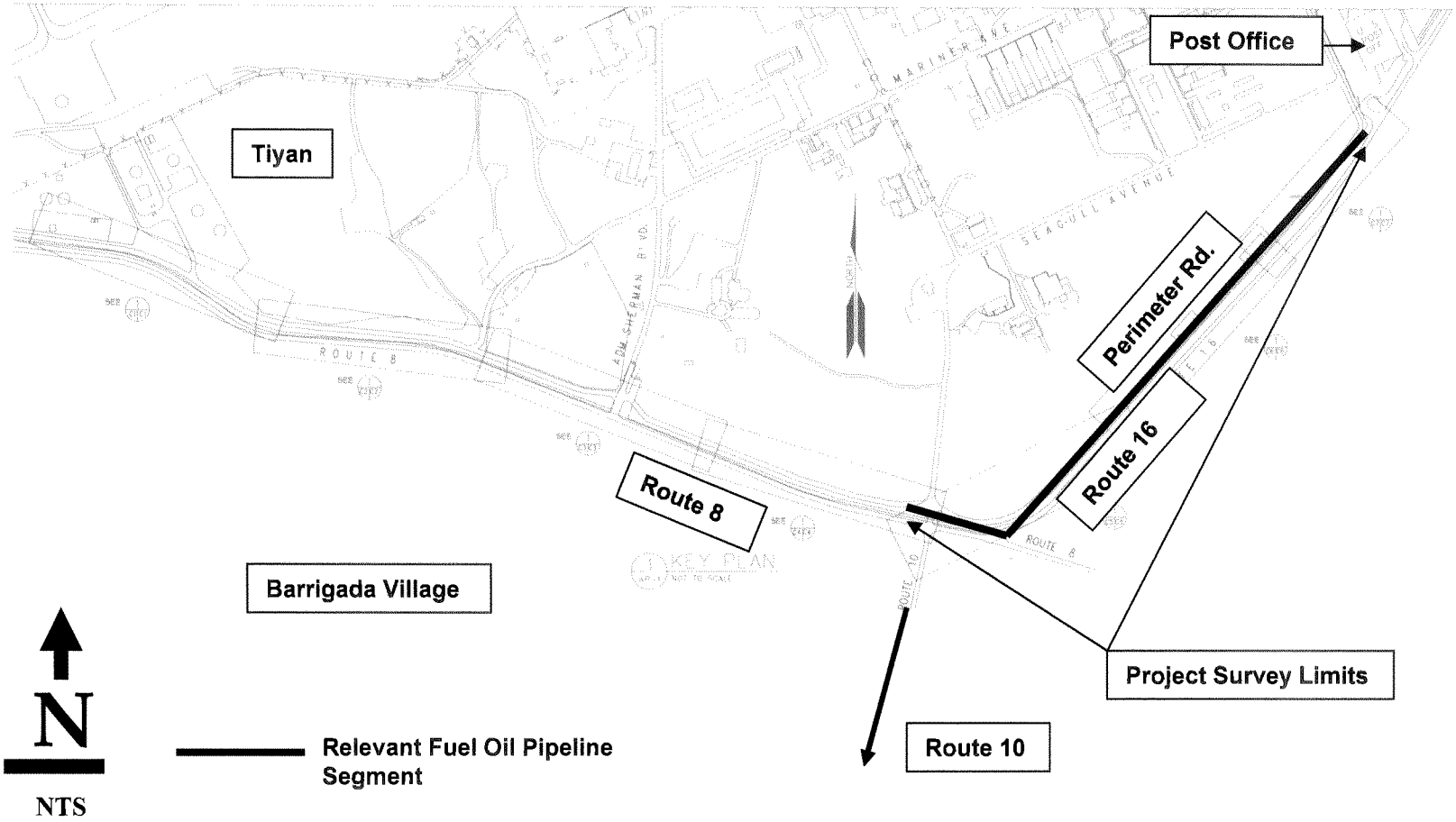
Source: USGS Quad Map

Location and Vicinity Map
GPA Fuel Oil Pipeline Project - Tiyan

ARC *Environmental Services*

Date
November 2006

Figure No.
1



Survey Limits
Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

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Date
November 2006

Figure No.
2

2.1.1 Documents Reviewed

The following documents were obtained from the NAVFACMAR Environmental Library, the Guam Power Authority (GPA) and the Defense State Memorandum of Agreement (DESMOA) division within the Guam Environmental Protection Agency (GEPA).

Draft Environmental Baseline Survey (EBS) For NAS Agana - November 1993

Finding of Suitability to Lease (FOSL) Various Navy Electrical Utility Facilities Guam - March 1996

Environmental Baseline Survey Update #1 For NAS Agana - July 2000

Technical Memorandum Re-evaluation of Risk Management Decisions at 12 Points of Interest (POIs) Former Naval Air Station (NAS) Agana, Guam - June 2004

Environmental Baseline Survey Various U.S. Navy Electrical Utility Facilities, Guam - January 1996

Underground Injection Control (UIC) Well Investigation Report NAS Agana - April 1997

Archeological Monitoring of NAS Agana, Tiyan Field, Guam Marianas Islands - April 1997

Addendum Operable Unit 2 Basewide Remedial Investigation NAS Agana (Tiyan), Guam Vol. 1 of 5RI Addendum Report - September 2006

Final Archival Search Formerly Used Defense Sites and Chemical Warfare Material Sites Territory of Guam, U.S.A. - September 2005

Draft First Semiannual 2006 Report – Semiannual Monitoring of Groundwater, Former NAS Agana (Tiyan), Guam – June 2006

2.1.2 Property Inspection

The subject easement was inspected by Mr. Joel Sablan on November 14, 2006. Appendix A includes photographs of this easement. These photographs show the recent completion of efforts to replace GPAs aboveground pipeline system with a new underground facility. Much of this effort is completed within the subject easement.

Further west however, aboveground pipeline removal is still underway. Both GPA's 8-inch underground pipeline containing Refined Fuel Oil (RFO) No. 6 and the Air Force's 10-inch fuel line reportedly containing Jet Fuel (JP-8), are co-located in the subject easement. Table 1 contains a check list of items which are of interest particular during site inspections. Relevant items are described in Section 3.0 Findings for the Subject Property.

Table 1
Important Features Observed

Important features	Observed	
	Yes	No
Storage Tanks - above or below ground		*
Odors		*
Pools of Liquid		*
Drums		*
Cylinders		*
Unidentified Substance Containers		*
PCBs (transformers, light ballasts, hydraulic contact eqpt.)		*
Stained Soil or Pavement	*	
Pits, Ponds or Lagoons		*
Stressed Vegetation		*
Solid Waste or Fill or Evidence of Grading	*	
Waste Water or Storm Water Disposal Areas		*
Wells		*
Septic Systems		*

2.1.3 Personal Interviews

The following individuals were interviewed either personally, by telephone or email correspondence.

Guam Power Authority

Mr. Perry Taladoc	Engineering Supervisor
Mr. Antonio Gumataotao	Rights-of-Way Supervisor
Mr. Steve C. Bautista	Project Engineer
Ms. Sylvia I Tumaneng	Engineering Supervisor Planning & Regulatory

Andersen Air Force Base

Mr. Greg Ikehara	Restoration Chief 36 CES/CEV
Mr. John Salas	Toxics/Storage Tanks/Air Manager 36 CES/CEV
Ms. Erlinda Steiner	Realty Specialist 36 CES/CEV
Tech Sgt. Fry	AAFB Fuels Management Flight
William Spoerer	Chief of Compliance 36 CES/CEV
Martin Stockman	HazWaste Program Manager 36 CES/CEV
2LT Jennifer Espinosa	NEPA EIAP Program Mgr. 36 CES/CEV

NAVFAC Marianas

Mr. Mark Cruz	Environmental Protection Specialist
Mr. Franklin Cruz	NAVSUP FISC Fuel Division Asst. Superintendent
Mr. Roberto Cabreza	Environmental Protection Specialist

Guam International Airport Authority

Mr. Raymond Topasna	Chief Planner

Guam Environmental Protection Agency (GEPA)

Mr. Walter Leon Guerrero	DESMOA Projects Manager

Mr. Mike O'Mallen	Envt'l Health Specialist Hazardous Waste
Mr. Benny Cruz	Engineer III Water Program

PCR Environmental (GIAA Environmental Consultant)

Mr. Paul Packbier	General Manager PCR Environmental

Department of Parks & Recreation - Historic Resources Division

Mr. Vic April	Territorial Archeologist

2.1.4 Sampling

N/A No sampling was included in this scope of work.

2.1.5 Aerial Photograph and Topographic Map Review

Aerial photographs contained in the various reports listed above were reviewed to establish historical land uses in the area. Aerial photographs and topographic maps were also obtained directly from the Micronesian Area Research Center (MARC) and the Bureau of Statistics and Plans (BOSP). These resources cover the years of 1944, 1946, 1953, 1956, 1968 and 2002 and are included in Appendix B.

Review of all available aerial photographs and topographic maps depict the presence of the fuel pipeline corridor or POL easement around 1954. Personnel at Andersen Air Force Base indicated the fuel facilities were established in 1953. The 1968 topographic map for Guam clearly shows where the pipeline enters NAS Agana across from the fuel tank farm on Route 8. The pipeline is depicted again at the bottom of Barrigada Hill. Drawings for a General Development Plan (1954) found in the NAS Agana EBS Update No. 1 (July, 2000) show the AV Gas Line running along perimeter road as it does today. Recreation facilities are shown along Perimeter Road in an area known as Leahy Field. Many of these facilities are still present.

2.1.6 Federal Database Research

An internet inquiry was conducted for records within available web-based information repositories such as Envirofacts Warehouse. Generally this research is conducted using zip codes and village names. The results of this research are contained in Appendix C. Any relevant information is presented in the appropriate subsections of Section 3.0 Findings for Subject Property. A similar discussion for surrounding areas is found in Section 4.0 Findings for Adjacent Properties.

Table 2
Standard Environmental Records Sources - Federal

Records Source and Minimum Search Distance	Sites Present within Minimum Search Dist. Yes	No
Federal NPL Site List (1.0 miles)		*
Federal CERCLIS List (0.5 miles)	*	
Federal NFRAP List (property and adjoining properties)		*
Federal RCRA Corracts List (1.0 miles)	*	
Federal RCRA non-CORRACTS TSD Facilities List (0.5 miles)		*
Federal RCRA Small and Large Quantity Generators List (property and adjoining properties)	*	
USEPA Enforcement and Compliance Sites (property and adjoining properties)		*
Toxics Release Inventory (property and adjoining properties)		*
Brownfields (property and adjoining properties)		*
EPA-Regulated Facilities in Envirofacts (property and adjoining properties)	*	
Federal NRC List (property only)		*

2.1.7 Local Database Research

A Freedom of Information Act (FOIA) request for relevant information was submitted to the GEPA on November 6, 2006. A partial GEPA response (Appendix D) was received on November 30, 2006. Table 3 below lists the items included in the FOIA. Information relevant to the subject easement is presented in the appropriate subsections of Section 3.0 Findings for Subject Property. A similar discussion for surrounding areas is found in Section 4.0 Findings for Adjacent Properties.

Table 3
Standard Environmental Records Sources – Local
(GEPA)

Records Source and Minimum Search Distance	Sites Present within Minimum Search Dist. Yes	No
Guam Pre CERCLIS Database (0.5)	*	
Local Equivalent NPL (0.5 miles)		*
Local Landfill or Solid Waste Disposal Sites (0.5 miles)	*	
Leaking Underground Storage Tanks (LUSTs) (0.5 miles)	*	
Registered Underground Storage Tank Lists (USTs) (property and adjoining properties)		*
Records of Contaminated Public Wells (0.5 miles)	*	
Records of Emergency Spill Response Reports (0.5 miles)	*	

3.0 FINDINGS FOR SUBJECT PROPERTY

3.1 History and Current Use

Available aerial photographs and other records indicate that the Tiyan area of Guam contained network of roads, a cistern and small sparsely populated hamlets and agricultural areas. At the close of WWII, NAS Agana was developed from the remains of a Japanese airfield. By the end of 1944 significant improvements to the airfield included a 6,000 foot runway, a taxiway, aviation fuel storage facilities and a road system. Development of NAS Agana accelerated with further growth and formal land acquisition proceedings throughout the 1950s. Total acreage at NAS Agana increased to over 2,031 acres.

NAS Agana was slated for closure as part of the 1993 Base Realignment and Closure (BRAC) program. On March 31, 1995, NAS Agana was operationally closed. Environmental investigation and cleanup activities continued through the formal transfer to the Government of Guam in 2000. Focused environmental investigation, cleanup and monitoring for some Points of Interest (POIs) and Installation Restoration Program (IRP) sites, are ongoing.

3.2 Environmental Setting NAS Agana

The former NAS Agana is located in central Guam atop a raised undulating limestone plateau that extends to the northern edge of the island. Elevation along Guam's northern limestone cliffs can reach 600 feet above sea level. This "half" of the island can be distinguished from the southern region where volcanic mountains and steep ravines channel surface water towards narrow coastal strands at sea level. The former NAS Agana or Tiyan area of the island is very near the transition between the two distinct regions of northern and southern Guam.

Elevations across NAS Agana range from 200 feet at the southwest extreme up to approximately 400 feet above sea level northeast towards Route 16 and Barrigada Hill. Much of the native forest vegetation that may have been present prior to WWII was impacted during the war and permanently altered to establish the air base shortly after the conflict. All forest resources within the base are considered "degraded."

A single wetland feature is recorded in the July 2000 EBS Update No. 1 for NAS Agana. No critical habitat areas have been designated within the former base. The single wetland feature on the base was reported to have been visited by an endangered Mariana Common Moorhen *(Gallinula chloropus guami).* No other threatened or endangered species are known to inhabit or forage within the former base. In general, wildlife diversity is considered low.

3.3 Hazardous Substances

A variety of hazardous substances were used on NAS Agana primarily in support of operations along the flight line. These substances often resulted in waste generation for which incomplete records exist.

The subject easement is located along the perimeter of the base. There are no records to suggest that hazardous substances were used, stored, or disposed of along the subject easement. Further details related to hazardous substance use/disposal are included in the sections below.

3.3.1 Hazardous Materials

Hazardous materials and petroleum products were historically used for numerous operations and maintenance activities on NAS Agana. These products often entered the base waste stream if they were not fully consumed. The 2000 Environmental Baseline Survey Update #1 for NAS Agana indicates that waste management practices in general were poorly documented between

1942 and 1987. Between 1987 and 1993 hazardous waste generation was identified for various operations on the base including quantity and waste description. These materials were reportedly removed from the base prior to it's operational closure.

3.3.2 Hazardous and Petroleum Waste

Review of available documents and personal interviews did not indicate that occurrences of hazardous or petroleum waste generation, storage or disposal adjacent to or within the subject easement.

3.4 IRP and POI Sites/Contamination

A total of two (2) IRP sites were identified on NAS Agana, the NAS Agana Landfill (IRP-01) and the Drainage Basin Holding Pond (IRP-02). The NAS Agana Landfill has been closed. IRP- 02 remains restricted to industrial reuse only. Both sites are more than 3,000 feet from the survey area.

A total of twenty-six (26) Points of Interest (POIs) were originally identified on NAS Agana. None of the original POIs that remain active are located within the fuel line corridor covered by this report.

POI-09, the Former Go Cart Track, is the closest POI to the subject site. The go cart track was located approximately 500 feet to the west of the subject easement (See Figure 3). Used aircraft engine oil was reportedly applied to the track on a periodic basis. This site has been proposed for unrestricted use based upon a risk management decision.

3.5 Storage Tanks

Previous surveys conducted for storage tanks identified sixteen (16) underground storage tanks (USTs) and eighteen (18) aboveground storage tanks (ASTs) within NAS Agana. According to available reports, the two (2) remaining storage tank features are located at the GEPA Cal Lab Building and at the former Navy Flying Club.

3.5.1 Aboveground Storage Tanks (ASTs)

No ASTs were observed within the subject easement during site inspections. Review of available documents and personal interviews do not indicate that ASTs were historically present within the subject easement.

3.5.2 Underground Storage Tanks (USTs)

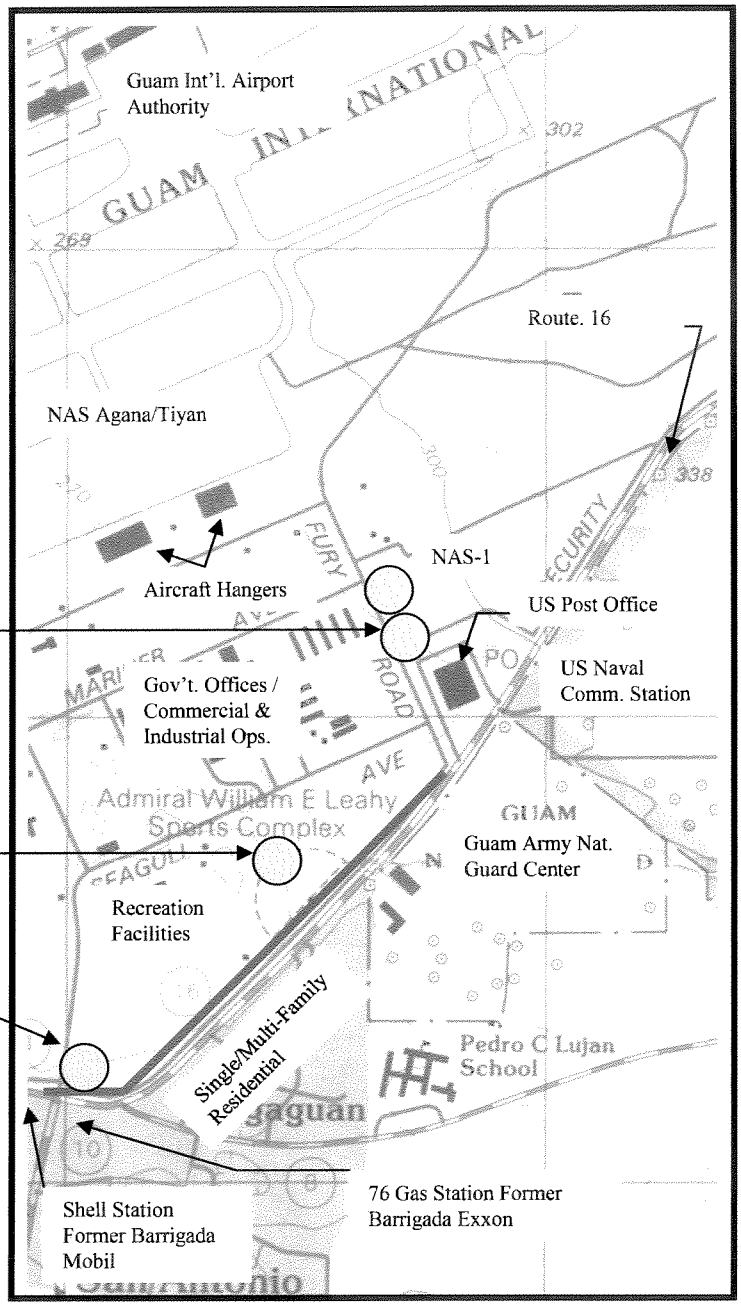
No USTs were observed within the subject easement during site inspections. Review of available documents and personal interviews do not indicate that USTs were historically present within the subject easement.

3.5.3 Pipelines, Hydrant Fueling, and Transfer Systems

The subject easement currently features a total of two (2) pipelines, a 10-inch Air Force fuel line and the 8-inch GPA fuel line. There are no hydrant fueling or transfer station facilities within the subject easement. None were identified during research activities.

Records Research

- On September 25, 2006 approximately 10-20 gallons of RFO No. 6 was released within the subject easement at the corner of Route 16 and the Main facility Post Office entrance. The release was reported to the GEPA. Immediate remedial actions were taken. GPA spill records indicate that a layer of contaminated top soil (approximately 4 cubic yards) was over-excavated and disposed of at a GEPA permitted disposal facility.



2002 7.5-Minute Topographic Map of Guam

NOT TO SCALE

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Source: USGS

Environmental Features of Interest
Phase I Environmental Site Assessment
Lot No. 5355-1-1B Mangilao

ARC *Environmental Services*

Date
November 2006

Figure
3

- On September 28, 2006 a second release occurred at the same location. Again, GEPA was informed and remedial action was taken. Approximately 10-15 gallons of RFO No. 6 was released. A 25 SF area of contaminated soil was removed and disposed of at a GEPA permitted facility. Confirmation samples were collected as required by GEPA.

- A release exceeding 20,000 gallons of oil occurred in 1982 "in Barrigada near Route 8." A very short segment of the subject easement is located near Route 8. According to available records, the spill was confined to a drainage basin pond underlain by silty clay. Approximately 770 cubic yards of contaminated soil was excavated. GEPA determined through sampling that groundwater had not been impacted. Attempts to identify the location of this spill were unsuccessful.

Site Visit

- During the site inspection, a minor release of RFO No. 6 was observed at one end of a pipe and valve assembly staged at the north end of the subject easement. The stained soil is shown on Photo 2B in Appendix A. The pipe end appeared to be sealed and taped off to prevent further releases. The release was estimated to be less than a half gallon.

3.6 Oil/Water Separators (OWSs)

No Oil/Water Separators were observed within the subject easement during site inspections. Review of available documents and personal interviews do not indicate that OWSs were historically present within the subject easement.

3.7 Pesticides and Herbicides

There are no records of pesticide use, release or disposal within the subject easement. There were no facilities present during the site inspections.

Herbicides use has been documented in EBS research efforts for the former NAS Agana. Available records indicate, a total of 560 gallons (Roundup and diuron) were used in 1990. However, the 1996 EBS completed for the Navy's electrical utility facilities, states that maintenance around pipelines was accomplished through mowing. Much of the pipeline is bordered by a perimeter fence. There are no records available substantiating the use of "weed killers" to control weed growth along the former perimeter fence.

3.8 Medical or Bio-hazardous Waste

The former Dental Clinic was a source of medical and bio-hazardous waste. This facility was not located near the subject easement. There are no records of medical or bio-hazardous waste use, generation, storage, release or disposal within the subject easement.

3.9 Ordnance

There are no records of, or personal interviews which, establish historical ordnance storage or disposal within the subject easement. Unexploded ordnance is potentially present throughout the island as a result of WWII battles.

3.10 Radioactive Waste

There are no records of radioactive or mixed radioactive waste generation or disposal within the former NAS Agana or the subject easement.

3.11 Solid Waste, Fill and Grading

There are no records, of solid waste disposal within the subject easement. The primary solid waste disposal location was at the NAS Agana Landfill approximately 3,600 ft west of the subject easement. An additional dump was reportedly located on the other side of Route 8 from the Tiyan Landfill. None of the interview respondents indicated knowledge of relevant solid waste disposal sites within or adjacent to the subject easement.

Numerous truck loads of fill material were recorded adjacent to the north end of the subject easement. The fill was placed on asphalt. This fill was identified as belonging to a Department of Parks and Recreation (DPR) vendor developing a recreational facility. The fill is reportedly free of contamination and is not part of the underground fuel line project.

Evidence of grading was present throughout the subject easement. This grading was a result of the GPA underground fuel oil pipeline project which is still in progress, west of the subject easement. According to GPA personnel, clean fill was used to install the new underground pipeline.

3.12 Ground Water

Groundwater monitoring is conducted bi-annually at thirteen (13) monitoring wells across the former air base. Trichloroethene (TCE), tetrachloroethene (PCE) and chloroform (TCM) are the contaminants of concern (COC). Monitoring Wells MW-08 and MW-13 (Figure 4) are closest to the existing pipeline easement. TCM was detected at both wells in 1995.

According to the Guam International Airport Authority's (GIAA) environmental consultant, these wells have since been abandoned and are no longer part of the Long Term Groundwater Monitoring program. Monitoring of production well (NAS-1) has likely replaced similar activities at MW-08. MW-13 near the southern end of the subject easement, was reportedly abandoned presumably after COCs decreased below applicable reporting limits.

3.13 Wastewater Treatment, Collection and Discharge

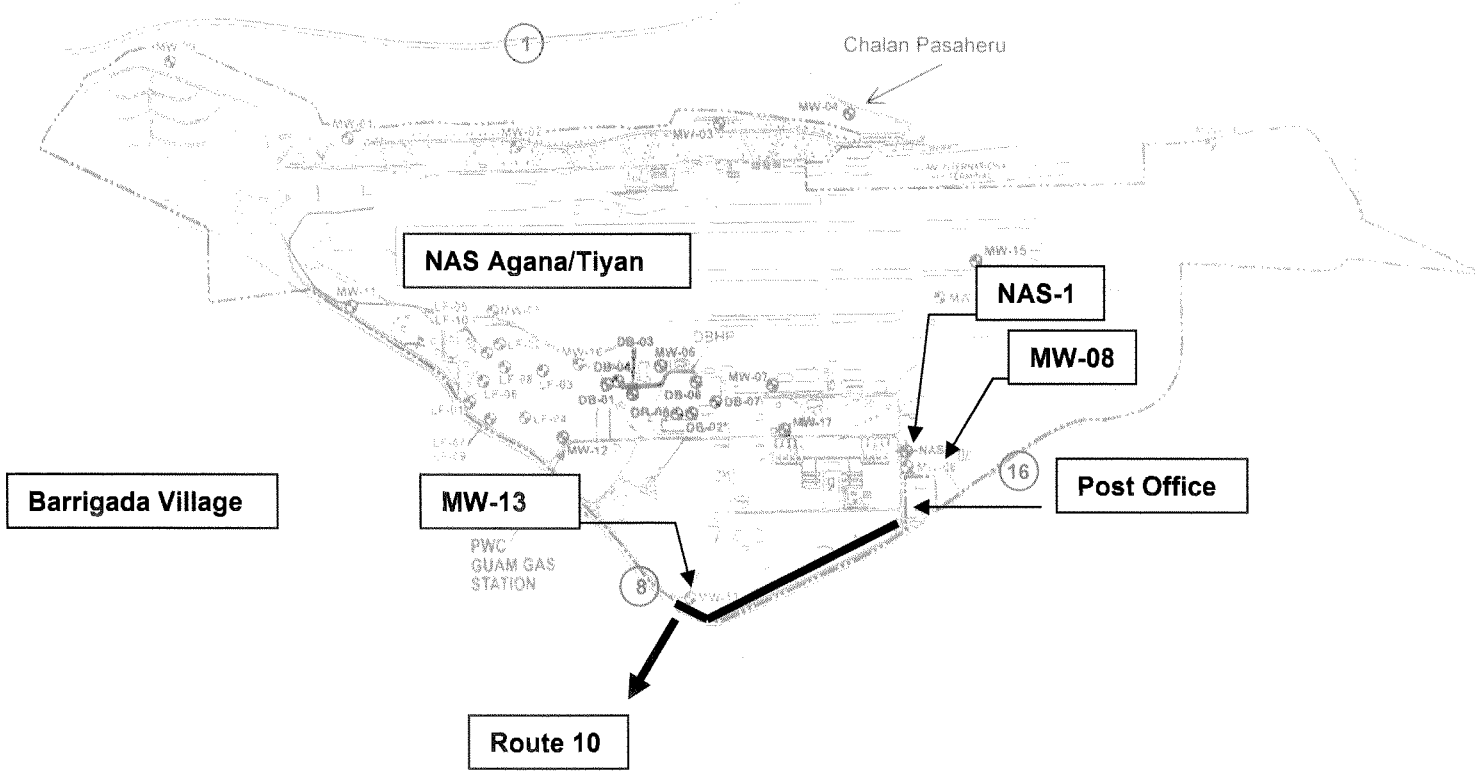
Restrooms at the existing softball field, across Perimeter Road, are on a leach-field system. A 6-inch sewer collection line serving the NAS Flyer Football Field proceeds north and away from the subject utility easement. There are no records of waste water treatment, collection or discharge facilities within the subject easement. No such facilities were observed during site inspections.

3.14 Drinking Water Quality

NAS-1 would be the closest existing production well on Tiyan. It is located approximately 1,400 feet from the post office end of the subject easement. This well has been retrofitted with a carbon filter treatment system to address historical TCE and PCE contamination. NAS-1 was recently brought back on line after a long period of dormancy. The treatment system is now being bypassed as a result of TCE and PCE concentrations below Maximum Contaminant Levels (MCLs) of 5 micrograms per liter. Periodic water quality monitoring continues at NAS-1.

3.15 Asbestos

Asbestos Containing Materials (ACM) are located throughout the former NAS Agana. Non-friable asbestos is the most common form of ACM. Review of available documents and personal interviews do not indicate that asbestos was historically used within the subject easement. No structures or other aboveground features were present within the subject easement during site inspections.



Relevant Fuel Oil Pipeline Segment

Source: PCR Environmental Inc.
Draft First Semiannual 2006 Report Semiannual Monitoring of Groundwater, Former NAS Agana Tiyan, Guam

NTS

Monitoring Wells
Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

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Figure No.
4

3.16 Polychlorinated Biphenyls

No mechanical, electrical or other equipment that could potentially contain PCB oil was observed within the subject easement. The Air Force and GPA pipelines reportedly contain JP-8 and RFO No.6 respectively. These fuels do not contain PCBs. There are no records of PCB use, storage, release or disposal within the subject easement limits.

3.17 Radon

No aboveground structures are present within the subject easement. Radon levels are regulated for "occupied" structures only.

3.18 Lead-Based Paint

GPA's existing aboveground pipeline is currently being decommissioned and removed. The 3,934 LF of pipeline that had been located within the subject easement, was removed prior to the site inspection. According to GPA personnel, the pipe coating was not sampled for LBP. 1994 LBP survey results for NAS Agana do not include the former fuel pipeline facilities.

3.19 Cultural and Natural Resources

Cultural and Natural Resource surveys have been completed for the former NAS Agana. A single location on the former base has been identified as potentially significant. Flora and fauna resources are considered degraded, significantly disturbed or of low diversity throughout much of the former base.

The subject easement has been disturbed historically and is currently developed as a POL easement. There are no special status species, valuable habitat or significant historic or cultural resources within the subject easement.

4.0 Findings for Adjacent Properties

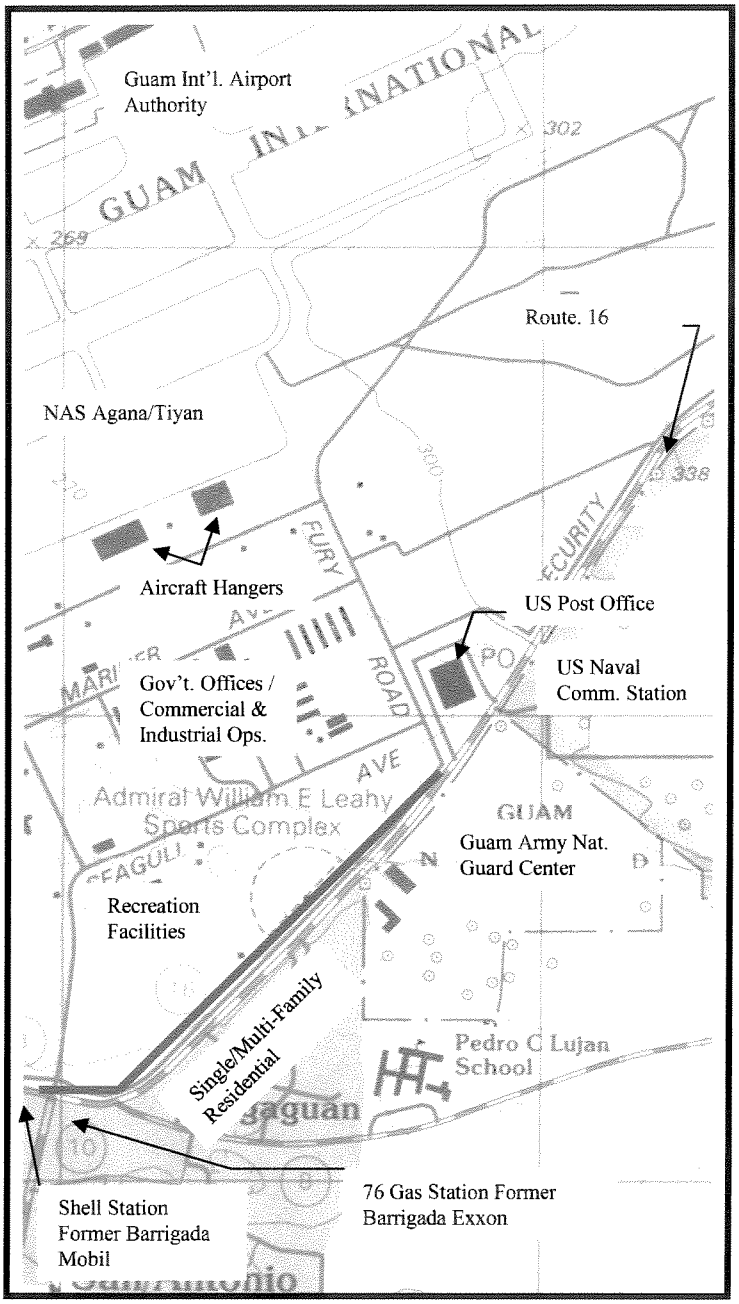
4.1 Land Uses

Perimeter Road and Route 16 border the subject easement to the west and east respectively. Recreational (NAS Flyer Football Field, baseball and softball fields and soccer fields) and open space areas are found on the Tiyan side of the subject easement. The A.B. Wonpat Guam International Airport (GIAA) and various Federal and local government and commercial operations dominate Tiyan beyond these recreational areas.

Route 16 is a 5 lane highway and is one of the primary links between the larger population areas in northern Guam, and the capital city of Agana. Mixed residential and commercial land use is found east of Route 16. Two service stations (Shell and 76) are located at the intersection of Routes 10-8 and 16. The Guam National Guard Center and the Naval Communications Station Barrigada are also located along Route 16. Figure 5 shows land use in the vicinity of the subject easement.

4.2 Adjacent Property Contamination

The presence of groundwater contaminants within NAS Agana continues to be monitored semi-annually. Contaminants of concern include; TCE, PCE and TCM, which originated from former NAS Agana operations, could potentially migrate towards the subject easement. However, decreasing levels of groundwater COCs and the abandonment of a nearby monitoring well (MW-13) implies a decreasing threat.



2002 7.5-Minute Topographic Map of Guam

NOT TO SCALE

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Source: USGS

Surrounding Land Use
Phase I Environmental Site Assessment
Lot No. 5355-1-1B Mangilao

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Figure
5

Fuel line releases or spills have occurred in numerous locations throughout the former NAS Agana, adjacent to the subject easement. These incidents are described in the EBS documents for NAS Agana. Three (3) releases are documented to have occurred in relatively close proximity to the subject easement. Both releases occurred at the perimeter of the former base and are described below.

Evidence of diesel and gasoline releases/staining were recorded at the Main Facility Post Office north of the subject easement. Contaminated soil was removed and preliminary closure assessment was completed in 1992. No additional information was provided in the partial GEPA FOIA response (Appendix D).

A second release location was recorded in 1991 at the former Barrigada Exxon Service Station (now a 76 station) 200 feet from the southern end of the subject easement. Used oil and approximately 1,000 gallons of gasoline reportedly leaked from USTs. A preliminary closure assessment was completed in 1992. No additional information was provided in the partial GEPA FOIA response (Appendix D).

A Leaking Underground Storage (LUST) site is located on the opposite side of Route 10 from the former Barrigada Exxon Station discussed above. According to GEPA personnel, a waste oil UST is located largely under the station building, however final removal and closure is pending due to potential building safety concerns.

5.0 Regulatory Compliance Issues

There are no known outstanding regulatory compliance issues associated with the subject easement.

6.0 CONCLUSIONS

6.1 Property Categories

Two (2) property categories are assigned to the subject easement based upon the findings in this survey. Figure 6 depicts these areas.

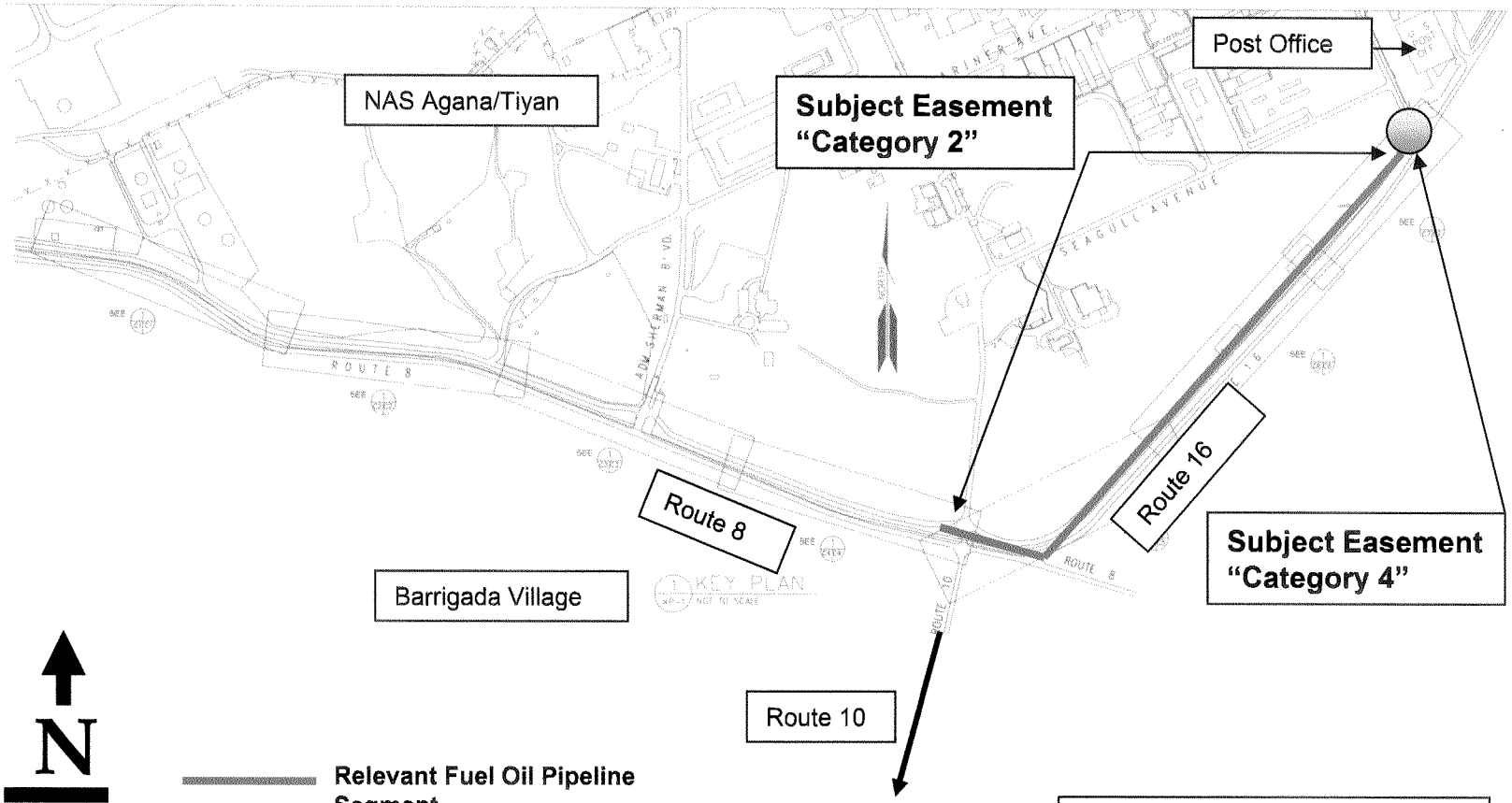
1.) Entire subject easement extending from the Route 10-8-16 intersection up to, but not including, the area near the US Main Facility Post Office impacted by small RFO No. 6 releases in September of 2006, is classified as Category 2.

> *Category 2*
> *Areas where only storage of hazardous substances or petroleum products has occurred (but no releases, disposal, or migration from adjacent areas has occurred)*

2.) The immediate area near the US Post Office impacted by the September 2006 RFO No. 6 releases is considered Category 4.

> *Category 4*
> *Areas where storage and/or releases, disposal, migration of hazardous substances or petroleum products has occurred, and all removal or remedial actions to protect human health and the environment have been taken.*

No other relevant information was obtained during the survey efforts that identified the presence of hazardous materials/substances or petroleum products contamination, spills, disposal or releases along the subject easement.



Easement Categories Map
Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

ARC *Environmental Services*

Date
November 2006

Figure No.
6

6.2 Data Gaps
No data gaps were identified during the completion of this EBS.

7.0 RECOMMENDATIONS
N/A

8.0 CERTIFICATIONS

8.1 Certification of the Environmental Baseline Survey
ARC Environmental Services has conducted this Environmental Baseline Survey on behalf of the Air Force and the Guam Power Authority. ARC Environmental Services has reviewed all appropriate records made available, and conducted visual site inspections of the selected facilities following an analysis of information during the record search. The information contained within the survey report is based on records made available and, to the best of our knowledge, are correct and current as of December 4, 2006.

12/4/06

Joel Sablan, Preparer — Date
ARC Environmental Services

8.2 PCB CLEARANCE
A records search and an on site inspection indicate that this property has not been exposed to PCB materials or equipment.

12/4/06

Joel Sablan, Preparer — Date
ARC Environmental Services

8.3 Certification of Contamination
This excess real property contains no known hazardous substances as that term is defined in the Comprehensive Environmental Response, Compensation and Liability Act (42 U.S.C. 9601), as amended, or other contamination as specified by the Resource Conservation and Recovery Act of 1976, the implementing Environmental Protection Agency regulations (40 CFR Parts 261, 262, 263, and 761), and the Federal Property Management Regulations (41 CFR Part 101-47). A complete search of available agency files revealed that no hazardous substance has been stored for more than one year, known to have been released, or disposed of on the Air Force-controlled real property described herein as the "Subject Easement."

12/4/06

Joel Sablan, Preparer — Date
ARC Environmental Services

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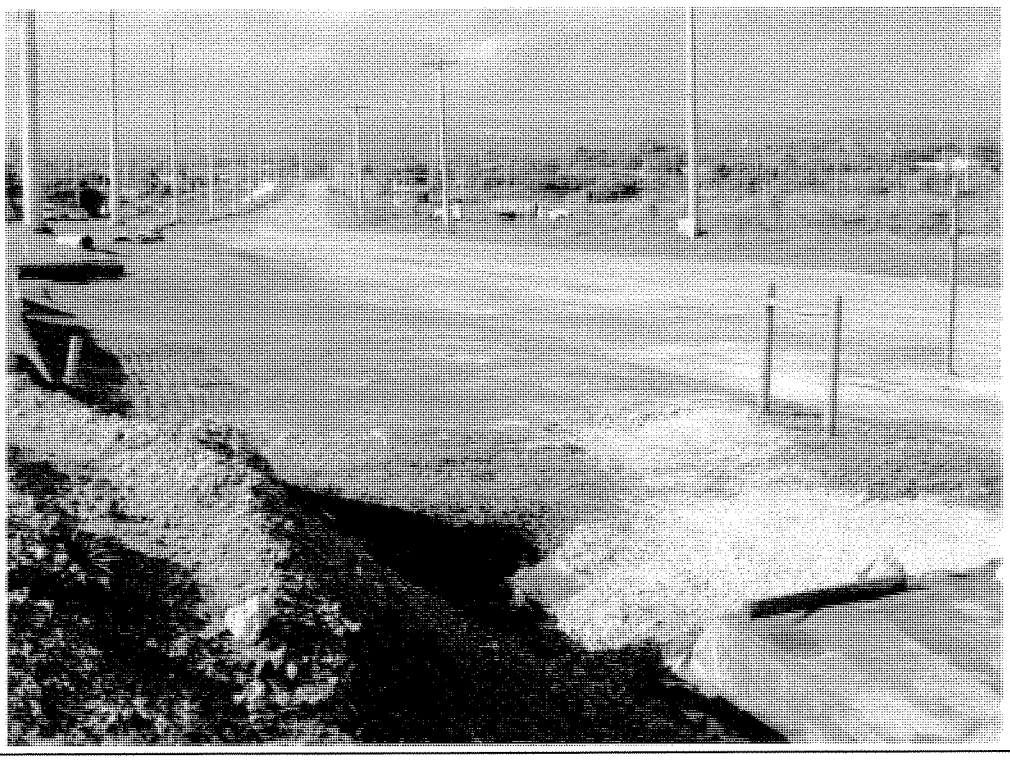
Appendix A
Photographs

1A



1B

1A: View from north end of subject easement towards the south along Perimeter Road

1B: Barrigada Main facility Post Office, northern end of subject easement

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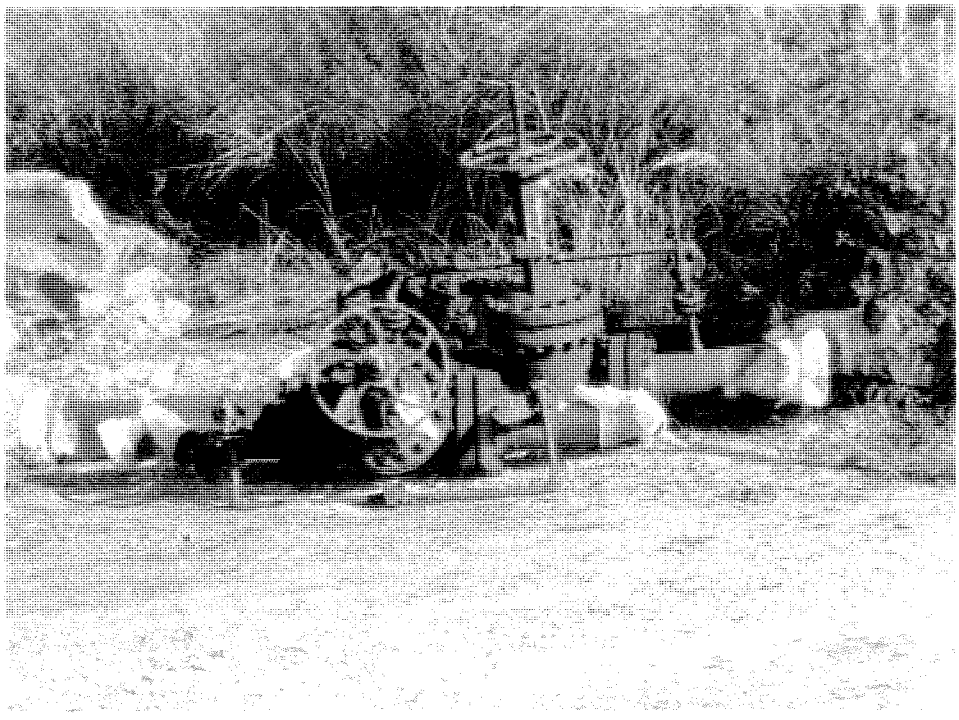
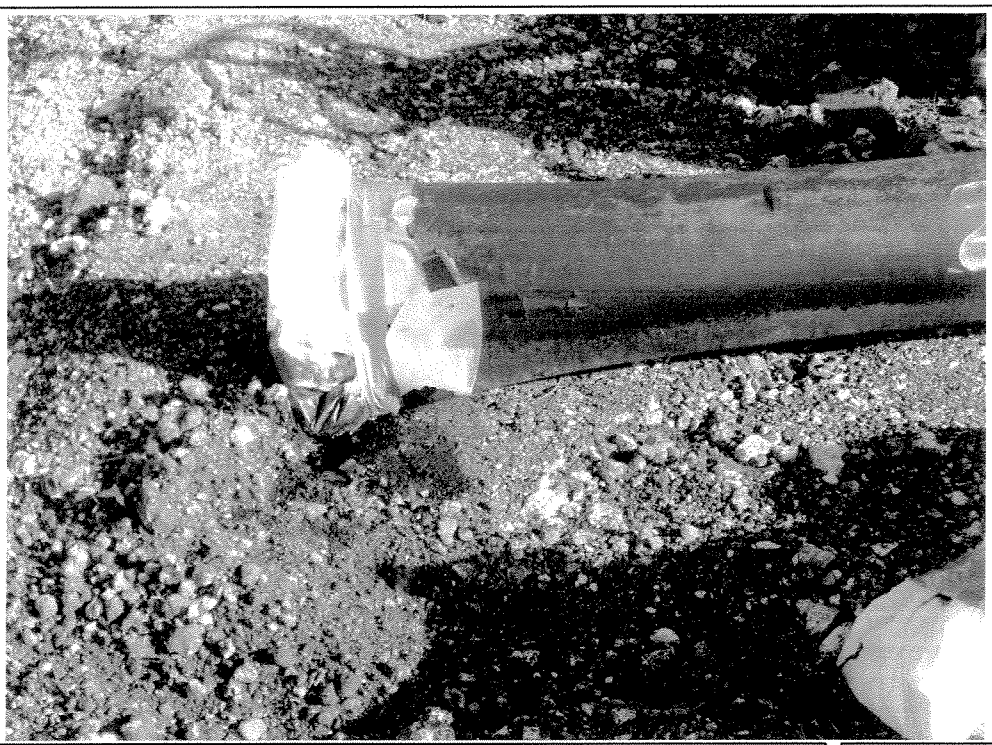
Date
November 2006

Photo Plate
1

2A



2B



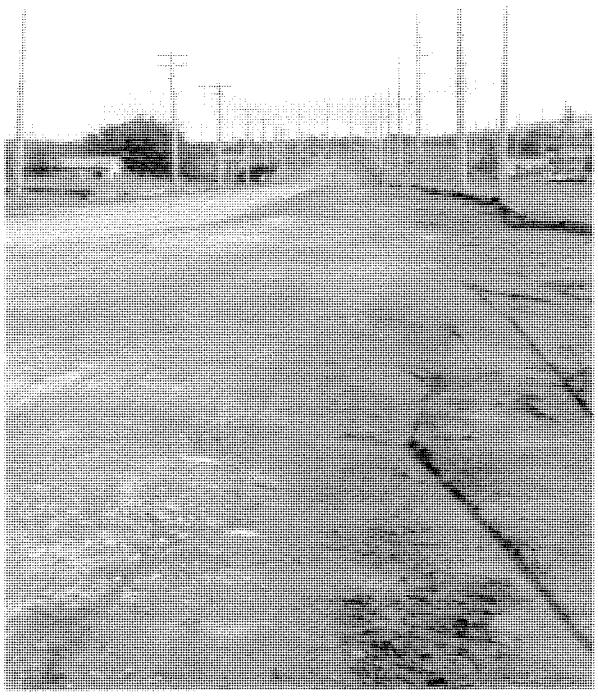
2A: Staged pipeline valve features at north end of easement
2B: Minor stain near valves

Date
November 2006

Photo Plate
2

ARC *Environmental Services*

3A



3A

3A: View from curve in Perimeter Road towards the north and end of easement.
3B: View around curve towards the southwest end of subject easement
Contractor performing final grading and cleanup in the background

ARC *Environmental Services*

Date
November 2006

Photo Plate
3

4A

4B

4A: Fuel pipeline vault near storm water drainage feature

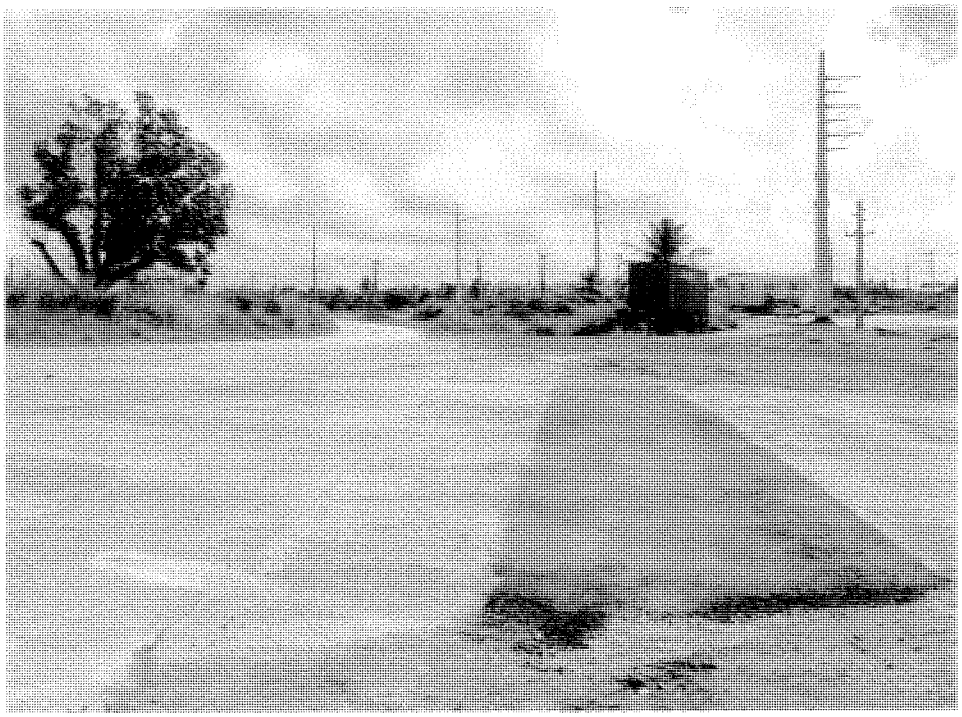
4B: NAS-1 water well with granulated activated carbon filter

Date
November 2006

Photo Plate
4

ARC Environmental Services

5A



5B

5A: Pavement crossing for underground pipeline Rt. 10-8-16 access to Tiyan

5B: Southern end of subject easement looking towards Rt. 10-8-16 intersection

Date
November 2006

Photo Plate
5

ARC *Environmental Services*

6A

6B

6A: View from southern end of subject easement towards the west

6B: Contractor cutting and sealing last few sections of aboveground pipeline near the Tiyan Fuel Pump Station (outside of subject easement)

ARC *Environmental Services*

Date
November 2006

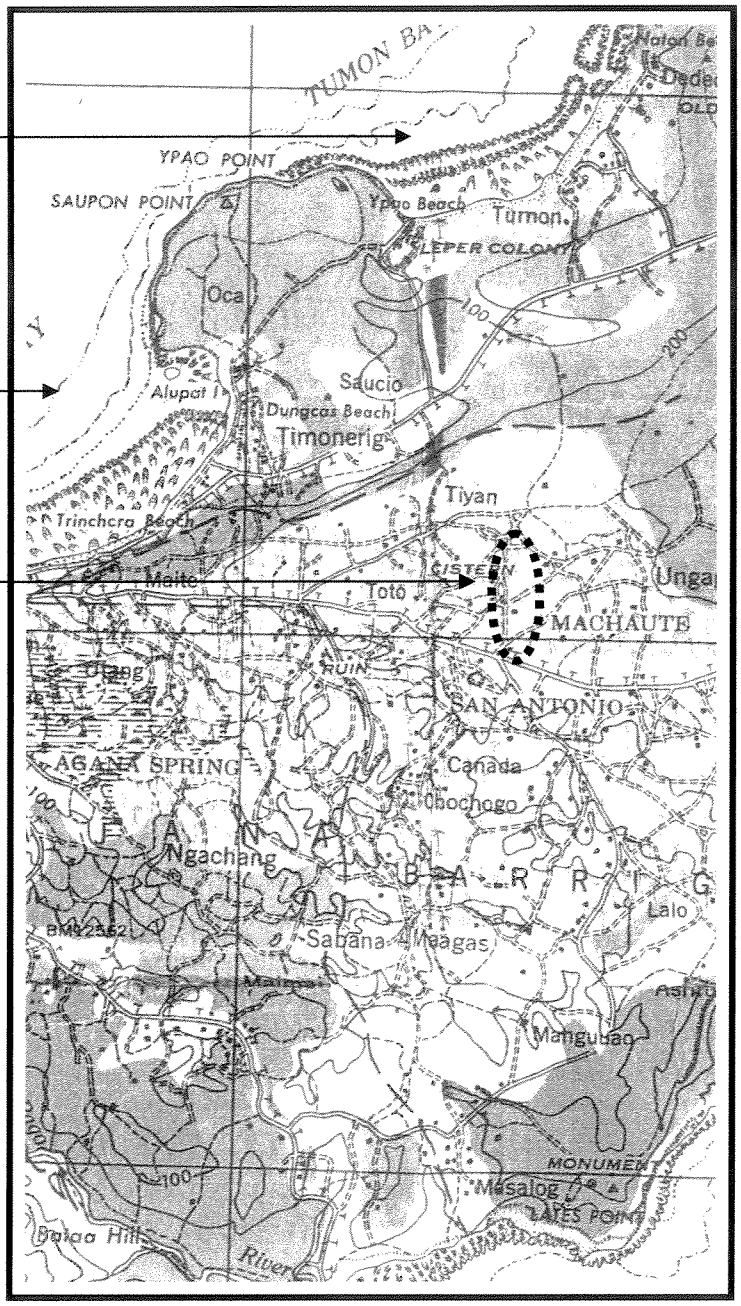
Photo Plate
6

Appendix B
Aerial Photographs
and Topographic Maps

Tumon Bay

East Agana Bay

Approximate Location of Subject Easement



1944 Topographic Map of Guam
Army Map Service, U.S. Army

NOT TO SCALE

N

Source: Micronesia Area Research Center – University of Guam

Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

ARC *Environmental Services*

Date
November 2006

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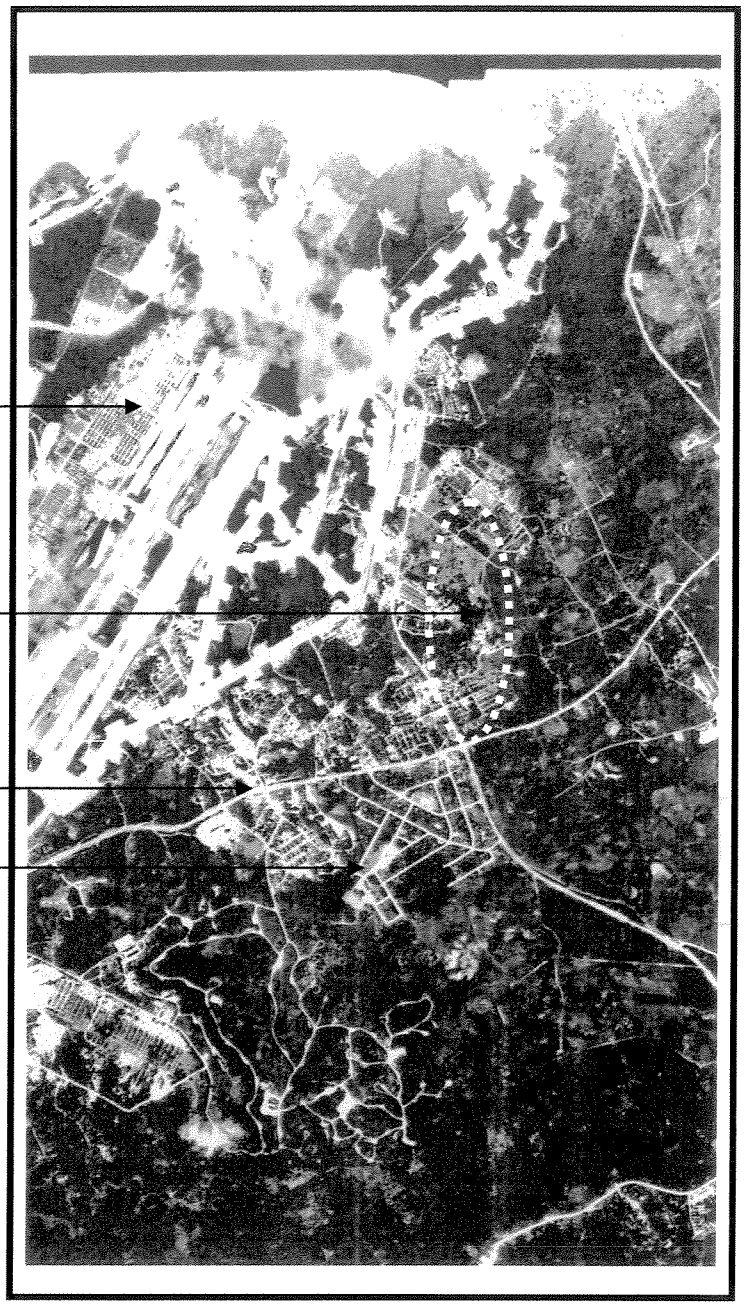

1946 Aerial Photo of Guam
NAS Agana

NOT TO SCALE

N

Source: Micronesia Area Research Center – University of Guam

Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

ARC *Environmental Services*

Date
November 2006

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Harmon Air Field

NAS Agana

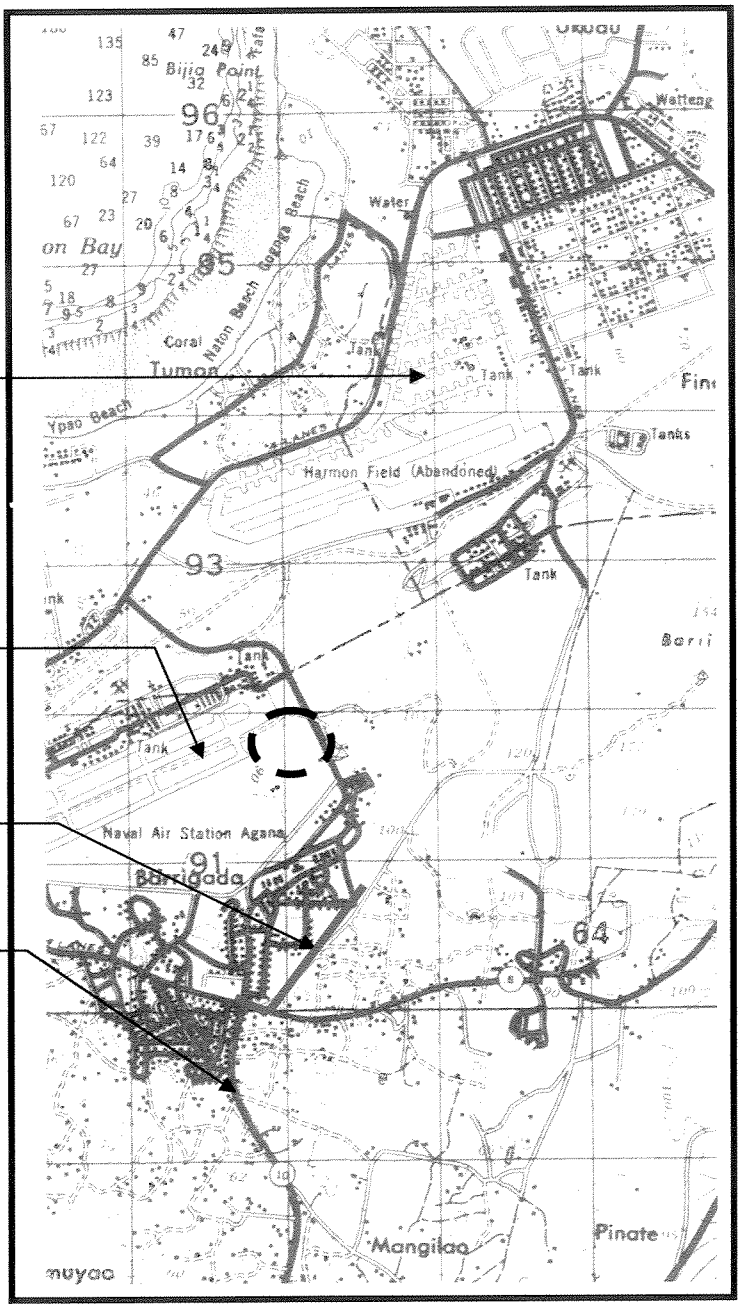
Approximate Location of Subject Easement

Route 10

1953 Topographic Map of Guam By the 64th Engineer Battalion

NOT TO SCALE

N



Source: Micronesia Area Research Center – University of Guam

Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

ARC Environmental Services

Date
November 2006

Appendix B
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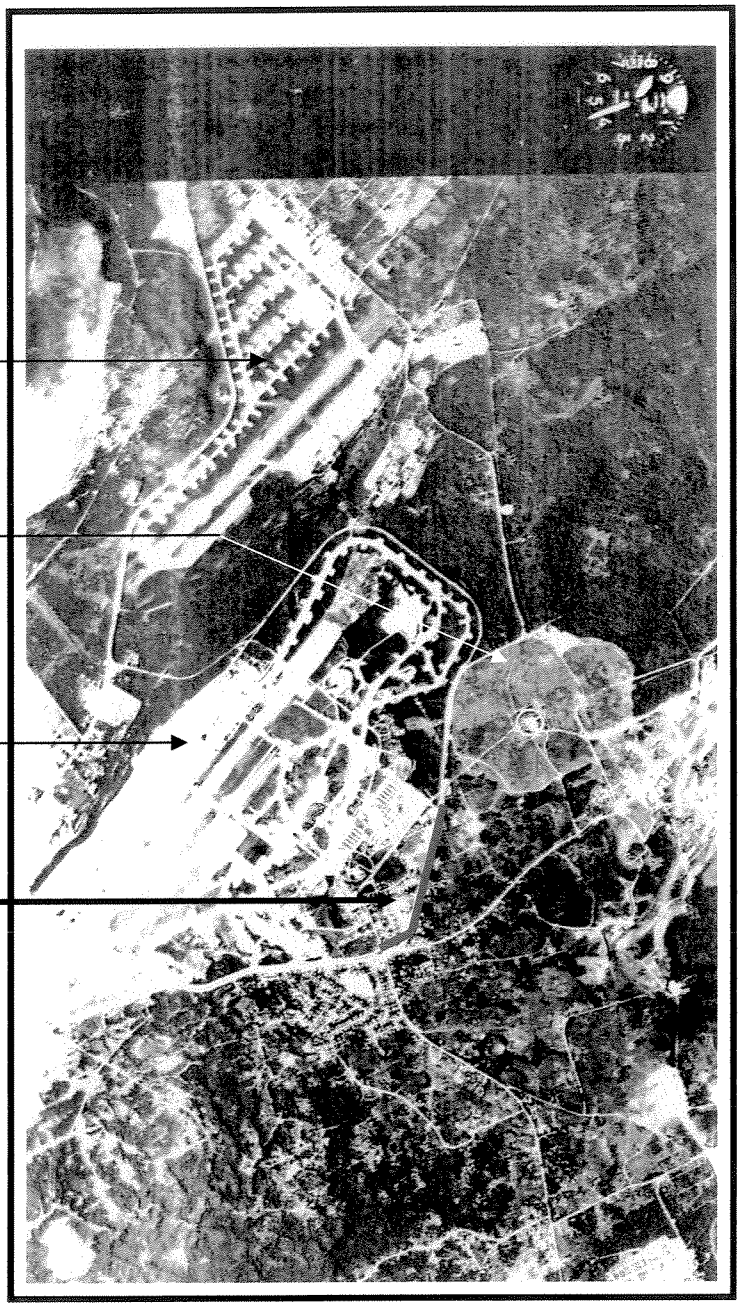

1956 Aerial Photograph
NAS Agana Guam

NOT TO SCALE

N

Source: Micronesia Area Research Center – University of Guam

Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

ARC Environmental Services

Date
November 2006

Appendix B
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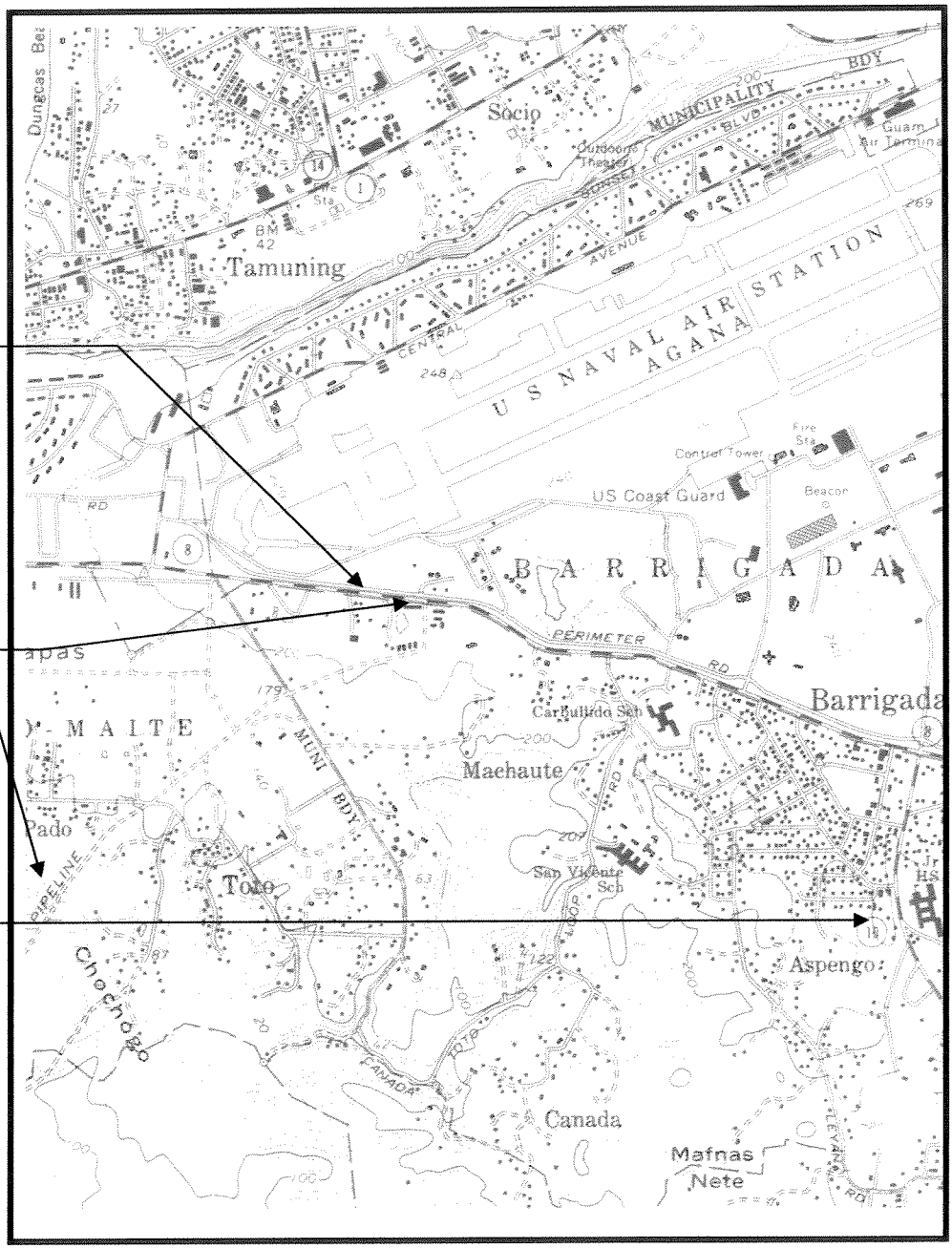

1968 Topographic Map of Guam
Pacific Area Geological Survey

Source: Micronesia Area Research Center – University of Guam

NOT TO SCALE

Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

ARC *Environmental Services*

Date
November 2006

Appendix B
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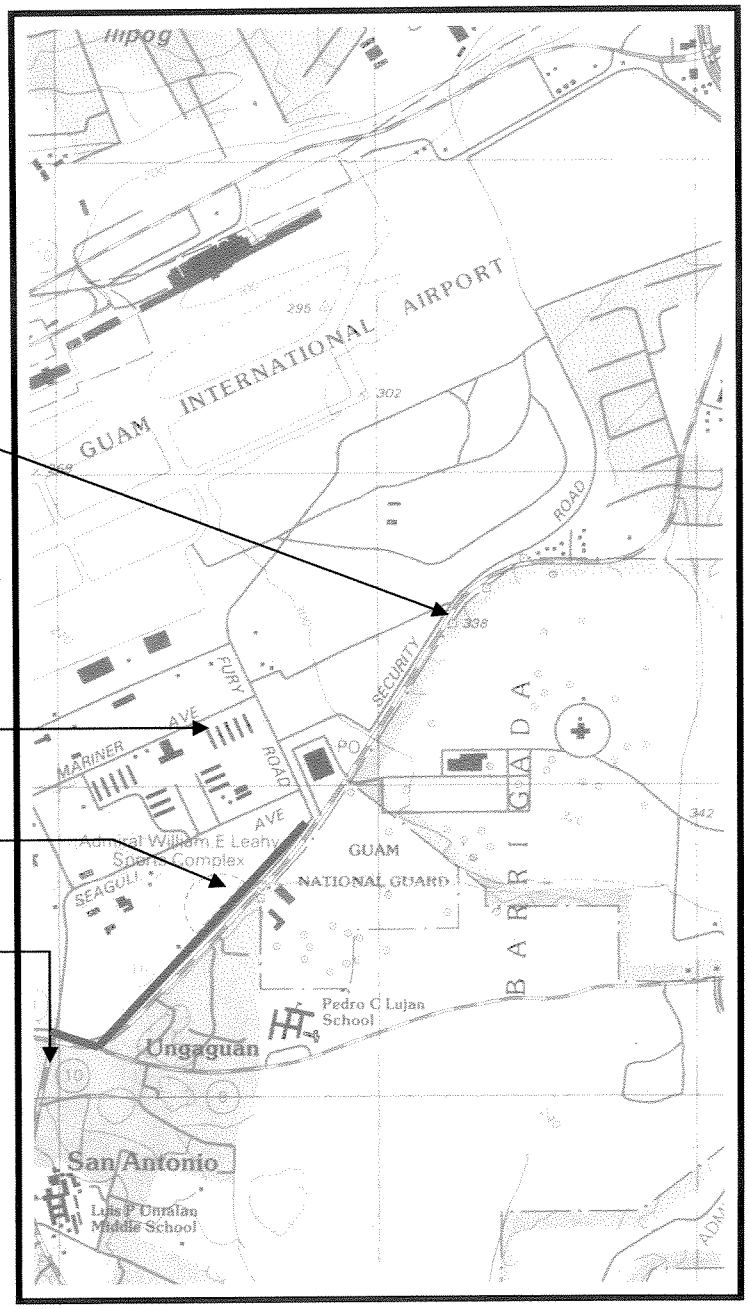

2002 USGS Topographic Map of Guam

NOT TO SCALE

N

Source: USGS

Phase I Environmental Baseline Survey
GPA Fuel Oil Pipeline Project - Tiyan

ARC *Environmental Services*

Date
November 2006

Appendix B
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Appendix C
Federal Database Research Output

U.S. Environmental Protection Agency

Envirofacts Data Warehouse

EF Overview
Queries, Maps, & Reports
Data Update
Technical User
Site Map
Contact Us

Quick Start!
View environmental information for any ZIP Code, City, or County.
Use State Abbreviations.

ZIP Code
City, State Abbr
County, State Abbr
GO

Data Update

Envirofacts

Data are retrieved from EPA source databases and posted to Envirofacts at various inter
will find the most recent dates that data were retrieved and posted to Envirofacts along w
frequency of these updates.

System	Retrieved	Posted	U Fre
Envirofacts AIRS Facility Subsystem (EF AIRS/AFS)	11/17/2006	11/28/2006	Update
Brownfields Management System (BMS)	11/14/2006	11/16/2006	Update
Biennial Reporting (BR)	11/18/2003	06/30/2004	Updat Two
Comprehensive Environmental Response, Compensation & Liability Information System (CERCLIS)	11/08/2006	11/24/2006	Update
Facility Registry System (FRS)	Nightly	Nightly	Update
RadNet, formerly Environmental Radiation Ambient Monitoring System	11/09/2006	11/15/2006	
Grants Information & Control System (GICS)	11/13/2006	11/15/2006	Upd W
Information Collection Rule (ICR)		05/17/2000	Final D Cor
Locational Reference Tables (LRT)		10/23/2006	Update
Permit Compliance System (PCS)	11/17/2006	11/22/2006	Update
Resource Conservation and Recovery Act Information (RCRAInfo)	06/06/2006	06/08/2006	Update
Safe Drinking Water Information System (SDWIS)	10/03/2006	10/24/2006	Up Qu
Toxics Release Inventory (TRI)	11/10/2006	11/21/2006	TRI 20 now

The Main Envirofacts Query accesses additional site information that is maintained by
Program. The dates listed below reflect when the Superfund Program posted the site

National Priorities List (NPL) Fact Sheets:

Posted (by Superfund): 05/16/1997

Record of Decisions (RODS) Documents:
Posted (by Superfund): 04/07/1997

Archived Site Reports:
Posted (by Superfund): 07/18/1997

CERCLIS Site Reports:
Posted (by Superfund): 07/18/1997

*** As of June 6th, 2006, pending migration to a new system, the data for the Permit System (PCS) will remain frozen in Envirofacts for the following states: MA, NH, RI MD, IN, NM, UT, HI, AK, ID**

U.S. Environmental Protection Agency

Radiation Information Database (RADINFO)

RADINFO

Query Results

Consolidated facility information (from multiple EPA systems) was searched to select facilities

ZIP Code: 96913

Total Number of Facilities Displayed: 0

U.S. Environmental Protection Agency

Enforcement & Compliance

Overview
Query
About the Data
More State Data
Frequently Asked Questions
ECHO
OECA Home
Contact Us
EF Home

Envirofacts

No information is available for ZIP Code 96913.

Using the "Back" button and select the ZIP Code on the query form.

U.S. Environmental Protection Agency

Envirofacts Data Warehouse

Query Results

Envirofacts

ZIP Code: 96913
City Name: Barrigada
State Abbreviation: GU
EPA Region Code: IX

LIST OF EPA-REGULATED FACILITIES IN ENVIROFACTS

To see a report on a facility click on the underlined Facility Name. Click on the underlined "View Facility Information" link to view EPA Facility information for the facility.

Go To Bottom Of The Page

FACILITY NAME/ADDRESS	FACILITY INFORMATION	Permitted Discharges to Water?	Toxic Releases Reported?	Hazardous Waste Handler?	Active or Archived Superfund Report?	Air Releases Reported?
ATKINS KROLL INC 443 S. MARINE DR. TAMUNING, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
BARRIGADA VILLAGE ABNDONED DUMP NAVAL COMMUNICATIONS STA BARRIGADA, GU 96913	View Facility Information	NO	NO	NO	**YES**	NO
BLACK CONSTRUCTION AMELCO YARD LOT 5292/3/25/3 AT AMELCO MANGILAO, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
COMMANDER, U.S. NAVAL FORCES MARIANAS BLDG 91 ADMIRAL NIMITZ RD BARRIGADA, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
EXXONMOBIL I H I AIRPORT						

112 MARINE DRIVE TAMUNING, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
EXXONMOBIL I H I ANIGUA 711 W MARINE DRIVE TAMUNING, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
EXXONMOBIL I H I BARRIGADA 112 ROUTE 10 BARRIGADA, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
GDOA MANGILAO PESTICIDE FACILITY 192 DAIRY ROAD MANGILAO, GU 96913	View Facility Information	NO	NO	NO	**YES**	NO
GUAHAN EQUIPMENT P.O. BOX 24177 BARRIGADA, GU 96913	View Facility Information	NO	NO	NO	NO	**YES**
GUAM ARMY NATIONAL GUARD 622 E. HARMON INDSTRL. PK. RD. TAMUNING, GU 969134421	View Facility Information	NO	NO	**YES**	NO	NO
GUAM ARMY NATIONAL GUARD USP AND FO BLDG 100 BARRIGADA, GU 96913-4421	View Facility Information	NO	NO	**YES**	NO	NO
GUAM COMMUNITY COLLEGE SESAME STREET MANGILAO, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
GUAM EPA'S LABORATORY CHEMICALS 15-6191 MARINER AVE TIYAN, GU 96913	View Facility Information	NO	NO	NO	**YES**	NO
GUAM MARRIOTT RESORT 627B PALE SAN VITORES ROAD TAMUNING, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
GUAM POLICE DEPT BLDG 1306 SUNSET BLVD TYAN	View Facility	NO	NO	**YES**	NO	NO

BARRIGADA, GU 96913	Information					
HAWAIIAN ROCK PRODUCTS GUAM 1402 ROUTE 15 MANGILAO, GU 96913	View Facility Information	NO	**YES**	NO	NO	**YES**
MOBIL BARRIGADA 7 11 111 RTE 10 BARRIGADA, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
MSG VICENTE DYDASCO ARMY RESERVE CTR B 64 ANNON AVE BARRIGADA, GU 969132208	View Facility Information	NO	NO	**YES**	NO	NO
PHOTO TOWN SERVICE INC 353 CHALAN SAN ANTONIO TAMUNING, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO
SOUTH PACIFIC PETROLEUM CORP 816 N. MARINE DR. EVA BLDG. 2ND FLOOR TAMUNING, GU 96913	View Facility Information	NO	**YES**	NO	NO	NO
YAMAS CO INC 148 BELLO RD BARRIGADA, GU 96913	View Facility Information	NO	NO	**YES**	NO	NO

Go To Top Of The Page

Total Number of Facilities Displayed: 21

U.S. Environmental Protection Agency

Resource Conservation and Recovery Act (RCRAInfo)

Query Results

RCRAInfo

Only RCRAInfo facility information was searched to select facilities

ZIP Code: 96913

Results are based on data extracted on JUN-06-2006

Note: Click on the underlined CORPORATE LINK value for links to that company's environmental web pages. Click on the underlined MAPPING INFO value to obtain mapping information for the facility.

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HANDLER NAME:	ATKINS KROLL INC	HANDLER ID:	GUD982442444
STREET:	443 S. MARINE DR.	FACILITY INFORMATION:	View Facility Information
CITY:	TAMUNING	CORPORATE LINK:	No
STATE:	GU	COUNTY:	GUAM
ZIP CODE:	96913	MAPPING INFO:	MAP
EPA REGION:	9		

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
FRED CARDINAS	443 S MARINE DR	TAMUNING	GU	96911	6716461876 799	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
811111	General Automotive Repair

HANDLER NAME:	BLACK CONSTRUCTION AMELCO YARD	HANDLER ID:	GUR000000166
STREET:	LOT 5292/3/25/3 AT AMELCO	FACILITY INFORMATION:	View Facility Information
CITY:	MANGILAO	CORPORATE LINK:	No
STATE:	GU	COUNTY:	GUAM

ZIP CODE: 96913
EPA REGION: 9

MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
BASIL TUPYI	PO BOX 73	BOISE	ID	83729	2083865703	Public

No NAICS Codes are available for the facility listed above.

HANDLER NAME: COMMANDER, U.S. NAVAL FORCES MARIANAS
STREET: BLDG 91 ADMIRAL NIMITZ RD
CITY: BARRIGADA
STATE: GU
ZIP CODE: 96913
EPA REGION: 9

HANDLER ID: GUR000128637
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
TROY S IMAMURA	PSC 455, BOX 152	FPO, AP	GU	96540-1000	671-339-3116	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
92811	National Security

HANDLER NAME: EXXONMOBIL I H I AIRPORT
STREET: 112 MARINE DR
CITY: TAMUNING
STATE: GU
ZIP CODE: 96913
EPA REGION: 9

HANDLER ID: GUR000111716
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
GIL VARGAS	P O BOX E U	HAGATNA	GU	96932	6716479663	Public

No NAICS Codes are available for the facility listed above.

HANDLER NAME:	EXXONMOBIL I H I ANIGUA	HANDLER ID:	GUR000111948
STREET:	711 W MARINE DR	FACILITY INFORMATION:	View Facility Information
CITY:	TAMUNING	CORPORATE LINK:	No
STATE:	GU	COUNTY:	GUAM
ZIP CODE:	96913	MAPPING INFO:	MAP
EPA REGION:	9		

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
GIL VARGAS	P O BOX E U	HAGATNA	GU	96932	6716479663	Public

No NAICS Codes are available for the facility listed above.

HANDLER NAME:	EXXONMOBIL I H I BARRIGADA	HANDLER ID:	GUR000111724
STREET:	112 RT 10	FACILITY INFORMATION:	View Facility Information
CITY:	BARRIGADA	CORPORATE LINK:	No
STATE:	GU	COUNTY:	GUAM
ZIP CODE:	96913	MAPPING INFO:	MAP
EPA REGION:	9		

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
GIL VARGAS	P O BOX E U	HAGATNA	GU	96932	6716479663	Public

No NAICS Codes are available for the facility listed above.

HANDLER NAME:	GRAND VIEW CORPORATION TUMON	HANDLER ID:	GUR000128678
STREET:	LOT 5134 1 TROPICANA HOTEL	FACILITY INFORMATION:	View Facility Information
CITY:	TUMON	CORPORATE LINK:	No
STATE:	GU	COUNTY:	GUAM

ZIP CODE: 96913 MAPPING INFO: MAP
EPA REGION: 9

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
FRED YAMON	PO BOX CM	HAGATNA	GU	96932	671-649-2470	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
72111	Hotels (except Casino Hotels) and Motels

HANDLER NAME: GUAM ARMY NATIONAL GUARD HANDLER ID: GU7210090026
STREET: 622 E. HARMON INDSTRL. PK. RD. FACILITY INFORMATION: View Facility Information
CITY: TAMUNING CORPORATE LINK: No
STATE: GU COUNTY: GUAM
ZIP CODE: 969134421 MAPPING INFO: MAP
EPA REGION: 9

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
DON S QUINATA	622 E HARMON IND PK RD	TAMUNING	GU	96911	671647280322	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
92811	National Security

HANDLER NAME: GUAM ARMY NATIONAL GUARD HANDLER ID: GUR000128686
STREET: USP AND FO BLDG 100 FACILITY INFORMATION: View Facility Information
CITY: BARRIGADA CORPORATE LINK: No
STATE: GU COUNTY: GUAM
ZIP CODE: 96913-4421 MAPPING INFO: MAP
EPA REGION: 9

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT

DON S QUINATA	622 E HARMON INDUSTRIAL PARK R	TAMUNING	GU	96913-4421	671-647-2803 22	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
92811	National Security

HANDLER NAME: GUAM COMMUNITY COLLEGE
STREET: SESAME STREET
CITY: MANGILAO
STATE: GU
ZIP CODE: 96913
EPA REGION: 9

HANDLER ID: GUR000128769
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
GREG T MANGLONA	PO BOX 23069	BARRIGADA	GU	96921	671-735-5529 529	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
61131	Colleges, Universities, and Professional Schools

HANDLER NAME: GUAM POLICE DEPT
STREET: BLDG 1306 SUNSET BLVD TYAN
CITY: BARRIGADA
STATE: GU
ZIP CODE: 96913
EPA REGION: 9

HANDLER ID: GUR000000133
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
FRANK BLAS	BLDG 1306 SUNSET BLVD	TIYAN	GU	96913	6714758565	Public

No NAICS Codes are available for the facility listed above.

HANDLER NAME: MOBIL BARRIGADA 7 11
STREET: 111 RTE 10
CITY: BARRIGADA
STATE: GU
ZIP CODE: 96913
EPA REGION: 9

HANDLER ID: GUR000126961
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
JAIME CAMPOS	P O BOX E U	HAGATNA	GU	96932	6716479600	Public

No NAICS Codes are available for the facility listed above.

HANDLER NAME: MSG VICENTE DYDASCO ARMY RESERVE CTR
STREET: B 64 ANNON AVE
CITY: BARRIGADA
STATE: GU
ZIP CODE: 969132208
EPA REGION: 9

HANDLER ID: GUR000128728
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
LIMWELL PADIOS	B 64 ANNON AVE	BARRIGADA	GU	969132208	671-344-5880	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
811111	General Automotive Repair
92811	National Security

HANDLER NAME: NISSAN MOTOR CORP GUAM
STREET: 1012 N MARINE DR
CITY: TAMUNING
STATE: GU
ZIP CODE: 96913

HANDLER ID: GUR000128579
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

EPA REGION: 9

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
PHILLIP BONNER	1012 N MARINE DR	TAMUNING	GU	96913	6716477261	Public

No NAICS Codes are available for the facility listed above.

HANDLER NAME: PHOTO TOWN SERVICE INC
STREET: 353 CHALAN SAN ANTONIO
CITY: TAMUNING
STATE: GU
ZIP CODE: 96913
EPA REGION: 9

HANDLER ID: GUR000121467
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
TATSURO HASEGAWA	P O BOX 6766	TAMUNING	GU	96931	6716461289	Public

LIST OF NAICS CODES AND DESCRIPTIONS

NAICS CODE	NAICS DESCRIPTION
44313	Camera and Photographic Supplies Stores

HANDLER NAME: YAMAS CO INC
STREET: 148 BELLO RD LOT T 1 BLK 1 TR
CITY: BARRIGADA
STATE: GU
ZIP CODE: 96913
EPA REGION: 9

HANDLER ID: GUR000000018
FACILITY INFORMATION: View Facility Information
CORPORATE LINK: No
COUNTY: GUAM
MAPPING INFO: MAP

CONTACT INFORMATION

NAME	STREET	CITY	STATE	ZIP CODE	PHONE	TYPE OF CONTACT
JASON FUKUDA	PO BOX 3299	AGANA	GU	96910	6716329827	Public

No NAICS Codes are available for the facility listed above.

Go To Top Of The Page

Total Number of Facilities Displayed: 16

U.S. Environmental Protection Agency

Toxics Release Inventory (TRI)

TRI

Query Results

Consolidated facility information (from multiple EPA systems) was searched to select facilities

ZIP Code: 96913
City Name: Barrigada

Results are based on data extracted on NOV-10-2006

Note:
Click on the underlined TRI_FACILITY_ID value to view a detailed report on the facility.
Click on "View Facility Information" to view EPA Facility information for the facility.
Click on the underlined SUBMISSIONS value to view the list of DCN's for each of the TRI Reporting Year.

Go To Bottom Of The Page

List of EPA-Regulated Facilities in TRI

TRI FACILITY ID	FACILITY INFORMATION	FACILITY NAME	ADDRESS	COUNTY NAME	SUBMISSIONS
96913HWNRC1402R	View Facility Information	HAWAIIAN ROCK PRODUCTS GUAM	1402 ROUTE 15 MANGILAO, GU 96913	GUAM	14
96913STHPC816NM	View Facility Information	SOUTH PACIFIC PETROLEUM CORP	816 N. MARINE DR. EVA BLDG. 2ND FLOOR TAMUNING, GU 96913	GUAM	37

Go To Top Of The Page

Total Number of Facilities Displayed: 2

U.S. Environmental Protection Agency

Superfund (CERCLIS)

CERCLIS

Query Results

Consolidated facility information (from multiple EPA systems) was searched to select facilities

ZIP Code: 96913
City Name: Barrigada
State Abbreviation: GU
EPA Region Code: 09

Results are based on data extracted on NOV-08-2006

Note: Click on the underlined CORPORATE LINK value for links to that company's environmental web pages.
Click on the underlined MAPPING INFO value to obtain mapping information for the facility.
Click on the underlined RECORD OF DECISION value for a RODS Site Report.
Click on the underlined "View Facility Information" link to view EPA Facility information for the facility.

Go To Bottom Of The Page

CERCLIS EPA ID:	GU5170090018	SITE NAME:	BARRIGADA VILLAGE ABNDONED DUMP
STREET ADDRESS:	NAVAL COMMUNICATIONS STA	**FACILITY INFORMATION**	View facility information
CITY NAME:	BARRIGADA		
STATE ABBR:	GU	FEDERAL FACILITY:	Y
ZIP CODE:	96913	NPL STATUS:	Not on the NPL
COUNTY NAME:	GUAM		
CORPORATE LINK:	No	RECORD OF DECISION (ROD) INFO:	No
LATITUDE:		EPA REGIONAL LINK:	No
LONGITUDE:		MAPPING INFO:	MAP
SITE SMSA:			

Enforcement and Cleanup Actions

Action	Action ID	Actual Start Date	Actual End Date	Responsibility	Planned Outcome	Urgency
DISCOVERY	001		06/01/1981	Federal Facilities		

Site Description

There were no Site Descriptions reported for this site.

CERCLIS EPA ID:	GUN000906128	SITE NAME:	GDOA MANGILAO PESTICIDE FACILITY
STREET ADDRESS:	192 DAIRY ROAD	**FACILITY INFORMATION**	View facility information
CITY NAME:	MANGILAO		
STATE ABBR:	GU	FEDERAL FACILITY:	N
ZIP CODE:	96913	NPL STATUS:	Not on the NPL
COUNTY NAME:	GUAM		
CORPORATE LINK:	No	RECORD OF DECISION (ROD) INFO:	No
LATITUDE:		EPA REGIONAL LINK:	No
LONGITUDE:		MAPPING INFO:	MAP
SITE SMSA:			

Enforcement and Cleanup Actions

Action	Action ID	Actual Start Date	Actual End Date	Responsibility	Planned Outcome	Urgency
REMOVAL	001	06/10/2005	09/30/2005	EPA Fund-Financed	Cleaned up	Time Critical

Site Description

There were no Site Descriptions reported for this site.

CERCLIS EPA ID:	GUN000906017	SITE NAME:	GUAM EPA'S LABORATORY CHEMICALS
STREET ADDRESS:	15-6191 MARINER AVE	**FACILITY INFORMATION**	View facility information
CITY NAME:	TIYAN		
STATE ABBR:	GU	FEDERAL FACILITY:	N
ZIP CODE:	96921	NPL STATUS:	Not on the NPL
COUNTY NAME:	GUAM		
CORPORATE LINK:	No	RECORD OF DECISION (ROD) INFO:	No
LATITUDE:		EPA REGIONAL LINK:	No
LONGITUDE:		MAPPING INFO:	MAP
SITE SMSA:			

Enforcement and Cleanup Actions

Action	Action ID	Actual Start Date	Actual End Date	Responsibility	Planned Outcome	Urgency
REMOVAL	001	09/24/2003	02/28/2004	EPA Fund-Financed	Cleaned up	Time Critical

Site Description

Description Text
Over a period of years, laboratory chemicals, wastes and solutions have been accumulated from local high schools and a closed GEPA laboratory. Many of the chemicals are outdated or in a degenerated condition and are no longer in use. The original containers for many of the chemicals are deteriorating.

Go To Top Of The Page

Total Number of Facilities Displayed: 3

Appendix D
GEPA FOIA Response Letter

GUAM ENVIRONMENTAL PROTECTION AGENCY

AHENSIAN PRUTEKSION LINA'LA GUAHAN

P.O. Box 22439 GMF • BARRIGADA, GUAM 96921 • TEL: 475-1658/9 • FAX: 477-9402

November 30, 2006
Ref: SRA 2007 06

Mr. Joel Sablan
ARC Environmental Services
P.O. Box 12331
Tamuning, Guam 96931

RE: Request for Information – Underground Fuel Oil Pipeline Air For POL - Tiyan

Dear Mr. Sablan:

This is a partial response of the Guam Environmental Protection Agency (Guam EPA) to your request for information dated November 6, 2006, for the **Underground Fuel Oil Pipeline Air For POL – Tiyan.** Guam EPA is continuing to review available records and we are able to provide the following information.

- Solid waste management or disposal facilities
    - Based on the map you provided there is no information for this area. If you would like our Solid Waste Division to search for more information, please send a list of businesses and property owners in the area.

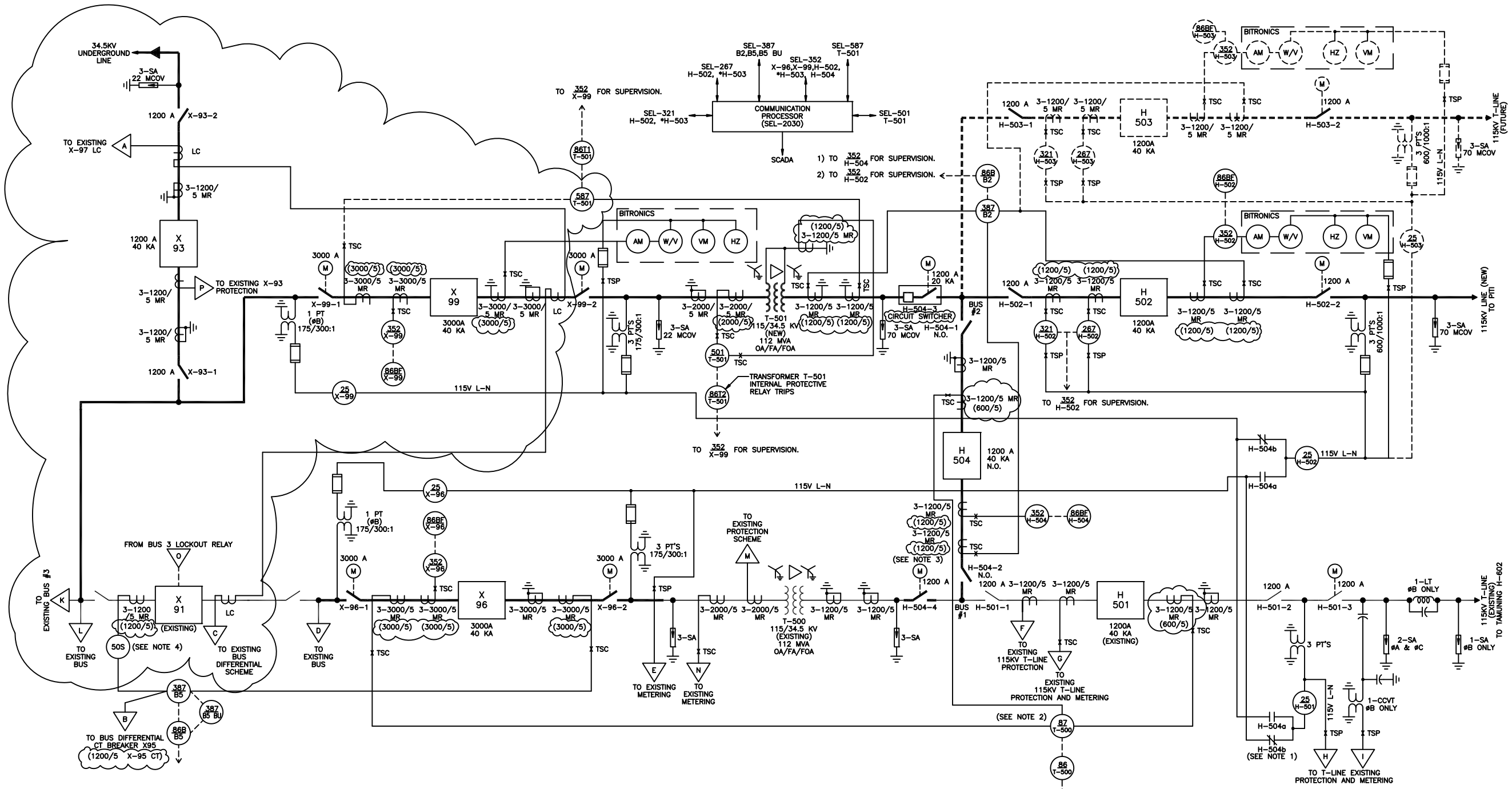
Information regarding LUSTs, USTs, hazardous material, contaminated public wells, sites of treatment, storage or disposal of hazardous material or petroleum products, pesticide storage or use, hazardous waste contaminated sites, Pre-CERCLIS and Brownfields sites is not readily available.

We are sorry for the delay but will send you the information as soon as possible. If you have any other questions please feel free to contact Tammy Anderson at 475-1663 or tammy.anderson@guamepa.net.

Dangkolo na Si Yu'os Ma'ase.

JOHN M.U. JOCSON
Acting Administrator

Harmon 115 kV Substation Expansion



LEGEND:

- X 96 — SF6 POWER CIRCUIT BREAKER
- POTENTIAL TRANSFORMER
- SURGE ARRESTER
- CURRENT TRANSFORMER
- TO 352 X-96 FOR SUPERVISION.
- AM — AMMETER
- HZ — FREQUENCY METER
- W/V — WATT/VAR METER
- VM — VOLTMETER
- A — CONTINUATION FLAG TO GPA ONE-LINE DIAGRAM "AS-BUILT"
- CABLE SEALING END
- FUSE
- DISCONNECT SWITCH (MANUAL)
- OPEN WHEN BREAKER IS OPEN (H-504a)
- CLOSED WHEN BREAKER IS OPEN (H-504b)
- X TSC CURRENT TEST SWITCH
- X TSP POTENTIAL TEST SWITCH
- NEW
- EXISTING
- FUTURE
- 112MVA 115/34.5KV TRANSFORMER
- DISCONNECT SWITCH (MOTOR OPERATED)
- CIRCUIT SWITCHER

352	SCHWEITZER (SEL-352) BREAKER FAILURE RELAY
25	SYNCHRONISM CHECK RELAY
50S	INSTANTANEOUS OVERCURRENT RELAY
86B	BUS DIFFERENTIAL LOCKOUT RELAY
86BF	BREAKER FAILURE LOCKOUT RELAY
86T1	TRANSFORMER DIFFERENTIAL LOCKOUT RELAY
86T2	TIME OVERCURRENT LOCKOUT RELAY
387	SCHWEITZER (SEL-387) CURRENT DIFFERENTIAL AND OVERCURRENT RELAY
267	SCHWEITZER (SEL-267) PHASE AND GROUND OVERCURRENT RELAY WITH RECLOSER
321	SCHWEITZER (SEL-321) PHASE AND GROUND DISTANCE RELAY
501	SCHWEITZER (SEL-501) OVERCURRENT RELAY
587	SCHWEITZER (SEL-587) CURRENT DIFFERENTIAL AND OVERCURRENT RELAY
LC	LINEAR COUPLER
*	FUTURE RELAY LOCATION

NOTES:

1. EXISTING SYNCHRONISM SCOPE WAS ABANDONED AND REPLACED WITH SYNCHRONISM CHECK RELAY.
2. EXISTING TRANSFORMER DIFFERENTIAL RELAY SCHEME HAS BEEN MODIFIED.
3. DISCONNECT SWITCH AND MOTOR OPERATOR WERE ADDED TO EXISTING DISCONNECT SWITCH STAND.
4. EXISTING OVERCURRENT RELAY.
5. SYSTEM PHASE ROTATION FOR THE GUAM ISLAND WIDE POWER TRANSMISSION AND DISTRIBUTION SYSTEM IS GPA C-B-A OR NEMA 1-2-3. ALL EQUIPMENT PURCHASED UNDER THIS CONTRACT SHALL BE WIRED, MARKED, AND RELAY ARRANGEMENT SHALL BE NEMA 1-2-3 LEFT-TO-RIGHT WITH NEUTRAL RELAYS UNDERNEATH PHASE RELAYS.

AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
6	AS BUILT	MDCI	6/14/01
5	AS BUILT	GT	1/30/01
4	PER G.P.A. REVISIONS	GT	1/05/01
3	PER G.P.A. REVISIONS	CS	11/6/00
2	PER G.P.A.	RAY	8/10/00
1	ADD BACKUP SEL-387 RELAY	JL	6/23/00

KEYSTONE ELECTRICAL MANUFACTURING CO. DES MOINES IOWA 50309

SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 9-22-99	D.G.R.	D.G.R.	D.G.R. Rude

1-LINE DIAGRAM
1999 EXPANSION
HARMON 115KV SUBSTATION

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092-1L

34.5KV UNDERGROUND LINE (TO X-103 TANGUISSON POWER PLANT)

Ø3 (A)
Ø2 (B)
Ø1 (C)

S.A. 22KV MCOV

1200A X-93-2

LC 1000 A/5V

#157A C101A → LC-30 TO EXISTING X-97 LC

C101B #157B → 2C398A TO NEW X-99 LC (THIS SHEET)

1200/5A MR

1200A 40KA X-93 34.5kV SF6GCB POLE 3 POLE 2 POLE 1

6Y5 C0 → 2C410 TO EXISTING X-93 PROTECTION (PNL.5,1B-R9)

1200/5A MR

C3 BLK
C2 WHT
C1 RED

C102 → 2/SH1 C1, 2/SH2 C2, 2/SH3 C3, 2/SH4 C0

1200/5A MR

1200A X-93-1

X-99-1 (M)

Ø3 (A)
Ø2 (B)
Ø1 (C)

3000A

3000/5A MR (3000/5)

X-99 34.5kV SF6GDB POLE 1 POLE 2 POLE 3 3000A 40KA

3000/5A MR (3000/5)

3000/5A MR (3000/5)

LC 1000 A/5V

X-99-2 (M)

3000A

Ø3 (A)
Ø2 (B)
Ø1 (C)

TO T-501 SEE DWG. 3092-A2

S.A. 22KV MCOV

TO EXISTING 34.5KV BUS SEE DWG. 3092-A3

175/300:1

20125:67/115V X-99 BUS #3 PT

H2 H1 Y3 Y2 Y1 X3 X2 X1 115V 67V

C106

1V21 1/LW1
1V01 1/LW2

FU-1 6A.

1/LA1 1V2
1/LA2 1V0

25/X-99 BE1-25 L B

TO 25/H-502 SYNC CHECK RELAY (DWG. 3092-A2A)

1/RN1 1/RN2

2V11 2V21 2V31 2V0 → C TO X-99 METERING (THIS DWG.)

FU-2 6A.

1/LA3 2V1
1/LA4 2V2
1/LA5 2V3
1/LA6 2V0

C107

C107A

TO T-501 AVR (TB V10 & V20) C2508

1/LW3 2V11
1/LW4 2V21
1/LW5 2V31
1/LW6 2V01

X-99/T501 PT's 20125:67/115V 175/300:1

Ø3 (A) Ø2 (B) Ø1 (C)

Y3 Y2 Y1 X3 X2 X1 115V 67V

149 C118 → TS-R12 X-99-587/T501 FT-1

1/SM1 C1
1/SM2 C2
1/SM3 C3
1/SM4 C0

587/T-501 SEL-587 (ACB)

TS-R1 T-501-587/T501 FT-1

1/SF1 6C1
1/SF2 6C2
1/SF3 6C3
1/SF4 6C0 → D TO T-501 CT's (DWG. 3092-A2)

C104 → TS-BF2 X-99-352 FT-1

2C1 1/SC1
2C2 1/SC2
2C3 1/SC3
2C0 1/SC4

352/X-99 SEL-352 (ACB)

C105 → TS-M1 X-99 FT-1

3C1 1/SA1
3C2 1/SA2
3C3 1/SA3
3C0 1/SA4

METER/X-99 MTWIE1B (ABC)

TS-M1 X-99 FT-1

FU-3 6A.

2V11
2V21
2V31
2V0 → C TO PT's (THIS DWG.)

DB9 → TO RTU RS-232 CABLE

157 C103 → TS-R4 X-93 FT-1

1C1 1/SB1
1C2 1/SB2
1C3 1/SB3
1C0 1/SB4

C130B → 2C398 TO EXISTING X-91 LC (DWG.3092-A3)

C101B #157B → 2C398A TO NEW X-93 LC (THIS SHEET)

~LEGEND~

- □ – CONTROL & RELAY PANEL TERMINAL BLOCK POINTS.
- ⊠ – CONTROL & RELAY PANEL SHORTING BLOCK POINTS.
- X1/B2 ← DENOTES TERMINAL No. / DENOTES UNIT No.
- ○ – DEVICE TERMINALS.
- ⊗ – TERMINALS ON FIELD LOCATED EQUIPMENT.
- 2/C #18TP – 2–CONDUCTOR, No. 18 AWG, TWISTED PAIR, SHIELDED CABLE.
- —— – NEW BUS.
- —— – EXISTING BUS.
- - - - - – FIELD CONNECTIONS.

C.T. RATIO CONNECTIONS

MARKED RATIO	SEC. TURN	SEC. TAPS
300:5	60	X3–X4
500:5	100	X4–X5
800:5	160	X3–X5
1000:5	200	X1–X2
1200:5	240	X2–X3
1500:5	300	X2–X4
2000:5	400	X2–X5
2200:5	440	X1–X3
2500:5	500	X1–X4
3000:5	600	X1–X5

AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
9	AS BUILT	MDCI	9/18/01
8	AS BUILT	GT	1/31/01
7	PER G.P.A REVISIONS	CS	11/6/00
6	REVERSE RELAY PHASING PER GPA	DR	8/1/00
5	ADD BACKUP SEL–387 RELAY	JFS	6/22/00
4	REVERSE BUS PHASING PER GPA	DR	4/20/00
3	ADD CABLE DETAILS	JL	4/6/00
2	PER GPA – 9/17/99	JFS	10/13/99
1	PER WIRING DIAGRAMS	PCAD	7–12–99

Keystone Electrical Manufacturing Co.
DES MOINES, IOWA 50309

SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 6/18/99	D.G.R.	DGR/PCAD	B.B. Rude

3–LINE A.C. SCHEMATIC DIAGRAM
RELAY & CONTROL PANELS 1, 2, & 3
HARMON 115KV SUBSTATION EXPANSION

BLACK & VEATCH INTL.
PROJECT No. 63.4401

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092–A1

~LEGEND~

- □ – CONTROL & RELAY PANEL TERMINAL BLOCK POINTS.
- ⊠ – CONTROL & RELAY PANEL SHORTING BLOCK POINTS.
- X1/B2 ← DENOTES TERMINAL No. / DENOTES UNIT No.
- ○ – DEVICE TERMINALS.
- ⊗ – TERMINALS ON FIELD LOCATED EQUIPMENT.
- 2/C #18TP – 2–CONDUCTOR, No. 18 AWG, TWISTED PAIR, SHIELDED CABLE.
- ——— – NEW BUS.
- ——— – EXISTING BUS.
- - - - - – FIELD CONNECTIONS.

387/B2 SEL–387 (ACB) — TS–R6 H–502–387/B2 — 2/SD1–4 — 11C1–11C0 — E — TO H–502 CT's (DWG. 3092–A2A)

TS–R9 H–504–387/B2 — 2/SF1–4 — 15C1–15C0 — F — TO H–504 CT's (DWG. 3092–A4)

TS–R3 T–501–387/B2 — 2/LN5–8 — 5C11–5C01 — 1/RN5–8 — 1/SE1–4 — 5C1–5C0 — C109

TS–R2 T–501–501 — 501/T–501 SEL–501 (ACB) — 1/SD1–4 — 4C1–4C0 — C108

TO 587/T–501 RELAYING (DWG. 3092–A1) — D — C110

H–503–1 — 1200A

H–503 115kV SF6 GCB — POLE 1 / POLE 2 / POLE 3 — 1200A 40KA

1200/5A MR (C1–C0) — H503 PTS 600/1000:1

H–503–2 — 1200A

ø3 (A) ø2 (B) ø1 (C) — 115kV OVERHEAD (FUTURE)

S.A. 70kV MCOV

TO SEL–321/H–503 SEL–267/H–503 BITRONICS/H–503 25/H–503 (FUTURE)

(FUTURE)

3/LQ1–5V1, 3/LQ2–5V2, 3/LQ3–5V3, 3/LQ4–5V0, 3/LQ5–5V11, 3/LQ6–5V21, 3/LQ7–5V31, 3/LQ8–5V01

T–501 115/34.5 kV 80/100/112 MVA OA/FA/FOA — X1 X3 X0 X2 — H1 H3 H0 H2

TO X–99 DWG. 3092–A1 — ø3 (A) X1, ø2 (B) X2, ø1 (C) X3

2000/5A MR (2000/5) — 2000/5A MR (2000/5) — 1200/5A MR (1200/5) — 1200/5A MR (1200/5)

H–504–3 CIRCUIT SWITCHER — 1200A 20KA

H–502–1 — 1200A — TO H–502 SEE DWG. 3092–A2A

TO H–504 SEE DWG. 3092–A4

TS–R2 T–501–501 FT–1 — 501/T–501 SEL–501 — 1/SG1, 1/SG2 — C111

T–501 TERTIARY WINDING — ø3 (A) Y1, ø2 (B) Y2, ø1 (C) Y3 — 1200/5A MR — 1200/5A MR

C.T. RATIO CONNECTIONS

MARKED RATIO	SEC. TURN	SEC. TAPS
100:5	20	X2–X3
200:5	40	X1–X2
300:5	50	X1–X3
400:5	90	X4–X5
500:5	100	X3–X4
600:5	120	X2–X4
800:5	160	X1–X4
900:5	180	X3–X5
1000:5	200	X2–X5
1200:5	240	X1–X5

AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
9	AS BUILT	MDCI	9/18/01
8	AS BUILT	GT	1/31/01
7	PER G.P.A REVISIONS	GT	1/05/01
6	PER G.P.A REVISIONS	CS	11/6/00
5	REVERSE RELAYING PHASING PER GPA	DR	8/1/00
4	REVERSE BUS PHASING PER GPA	DR	4/20/00
3	ADD CABLE DETAILS	JL	4/6/00
2	PER GPA – 9/17/99	JFS	10/14/99
1	PER WIRING DIAGRAMS	PCAD	7–12–99

Keystone Electrical Manufacturing Co.
DES MOINES, IOWA 50309

SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 6/18/99	D.G.R.	DGR/PCAD	

3–LINE A.C. SCHEMATIC DIAGRAM
RELAY & CONTROL PANELS 1, 2, & 3
HARMON 115KV SUBSTATION EXPANSION

BLACK & VEATCH INTL.
PROJECT No. 63.4401

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092–A2

C.T. RATIO CONNECTIONS

MARKED RATIO	SEC. TURN	SEC. TAPS
100:5	20	X2–X3
200:5	40	X1–X2
300:5	50	X1–X3
400:5	90	X4–X5
500:5	100	X3–X4
600:5	120	X2–X4
800:5	160	X1–X4
900:5	180	X3–X5
1000:5	200	X2–X5
1200:5	240	X1–X5

~LEGEND~

- □ – CONTROL & RELAY PANEL TERMINAL BLOCK POINTS.
- ⊠ – CONTROL & RELAY PANEL SHORTING BLOCK POINTS.
- X1/B2 ← DENOTES TERMINAL No. / DENOTES UNIT No.
- ○ – DEVICE TERMINALS.
- ⊗ – TERMINALS ON FIELD LOCATED EQUIPMENT.
- 2/C #18TP – 2–CONDUCTOR, No. 18 AWG, TWISTED PAIR, SHIELDED CABLE.
- —— – NEW BUS.
- —— – EXISTING BUS.
- - - - - – FIELD CONNECTIONS.

TS–R7 H–502–321 FT–1 · 321/H–502 SEL–321 (ACB) · TS–R7 H–502–321 FT–1

C112 · 8C1 2/SB1 · 8C2 2/SB2 · 8C3 2/SB3 · 8C0 2/SB4

TS–R8 H–502–267 FT–1 · 267/H–502 SEL–267 (ACB) · TS–R8 H–502–267 FT–1

C113 · 9C1 2/SC1 · 9C2 2/SC2 · 9C3 2/SC3 · 9C0 2/SC4

FU–5 6A. · 2/LA5 –3VY1 · 2/LA6 –3VY2 · 2/LA7 –3VY3 · 2/LA8 –3V0 → C132 TO 67V PT's (THIS DWG.)

TS–M2 H–502 FT–1 · 352/H–502 SEL–352 (ACB) · METER/H–502 MTWIE1B (ABC) · TS–M2 H–502 FT–1

C114 · 10C1 2/SA1 · 10C2 2/SA2 · 10C3 2/SA3 · 10C0 2/SA4

3V11 · 3V21 · 3V31 · 3V0 → G TO 115V PT's (THIS DWG.)

DB9 → TO RTU RS–232 CABLE

C115 → E TO 387/B2 RELAYING (DWG 3092–A2)

8C1 8C2 8C3 8C0 · 9C1 9C2 9C3 9C0 · 10C0 10C3 10C2 10C1 · 11C0 11C3 11C2 11C1

TO H–502–1 SEE DWG. 3092–A2

ø3 (A) ø2 (B) ø1 (C)

1200/5A MR (1200/5) · 1200/5A MR (1200/5) · H–502 115kV SF6OCB POLE 1 POLE 2 POLE 3 1200A 40KA · 1200/5A MR (1200/5) · 1200/5A MR (1200/5)

H–502–2 (M) 1200A

ø3 (A) ø2 (B) ø1 (C) NEW 115kV OVERHEAD LINE TO PITI

S.A. 70kV MCOV

H2 H1 H2 H1 H2 H1 · 115kV BUS #2 PT's 69000–67/115V 600/1000:1 · ø3 (A) ø2 (B) ø1 (C)

Y3 Y2 Y1 X3 X2 X1 · 115V 67V

3VY1 3VY2 3VY3 3V0 → C132 TO H–502 RELAYING (THIS DWG.) · C116A · C116

TO 25/X–99 SYNC CHECK RELAY (DWG. 3092–A1) · TO 25/X–96 SYNC CHECK RELAY (DWG. 3092–A3)

2V21 2V0 · 5V21 5V0

2/LN1 2/LN2 2/LN3 2/LN4

2/RD1 2/RB1 2/RC1 2/RD7 2/RB3 2/RD5 2/RC3 2/RD3

85 55 57 91 59 89 61 87

H–504 a H–504 b H–504 a H–504 a H–504 b H–504 b H–504 a H–504 a

86 56 58 92 60 90 62 88

2/RD2 2/RB2 2/RC2 2/RD8 2/RB4 2/RD6 2/RC4 2/RD4

TO 25/H–501 SYNC CHECK RELAY (DWG 3092–A4A) · 501 Bø 2/RL1 · 501 N 2/RL2

25/H–502 BE1–25 · 25/502 · B L

3V11 3V21 3V31 3V0 → G TO H–502 METERING (THIS DWG.)

FU–4 6A. · 2/LA1 3V1 · 2/LA2 3V2 · 2/LA3 3V3 · 2/LA4 3V0

AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
9	AS BUILT	MDCI	9/18/01
8	AS BUILT	GT	1/31/01
7	PER G.P.A REVISIONS	GT	1/05/01
6	PER G.P.A REVISIONS	CS	11/6/00
5	SEPARATE SEL POTENTIAL INPUT	RAY	9/4/00
4	REVERSE RELAYING PHASING PER GPA	DR	8/2/00
3	REVERSE BUS PHASING PER GPA	DR	4/20/00
2	ADD CABLE DETAILS	JL	4/6/00
1	PER GPA – 9/17/99	JFS	10/14/99

Keystone Electrical Manufacturing Co.
DES MOINES, IOWA 50309

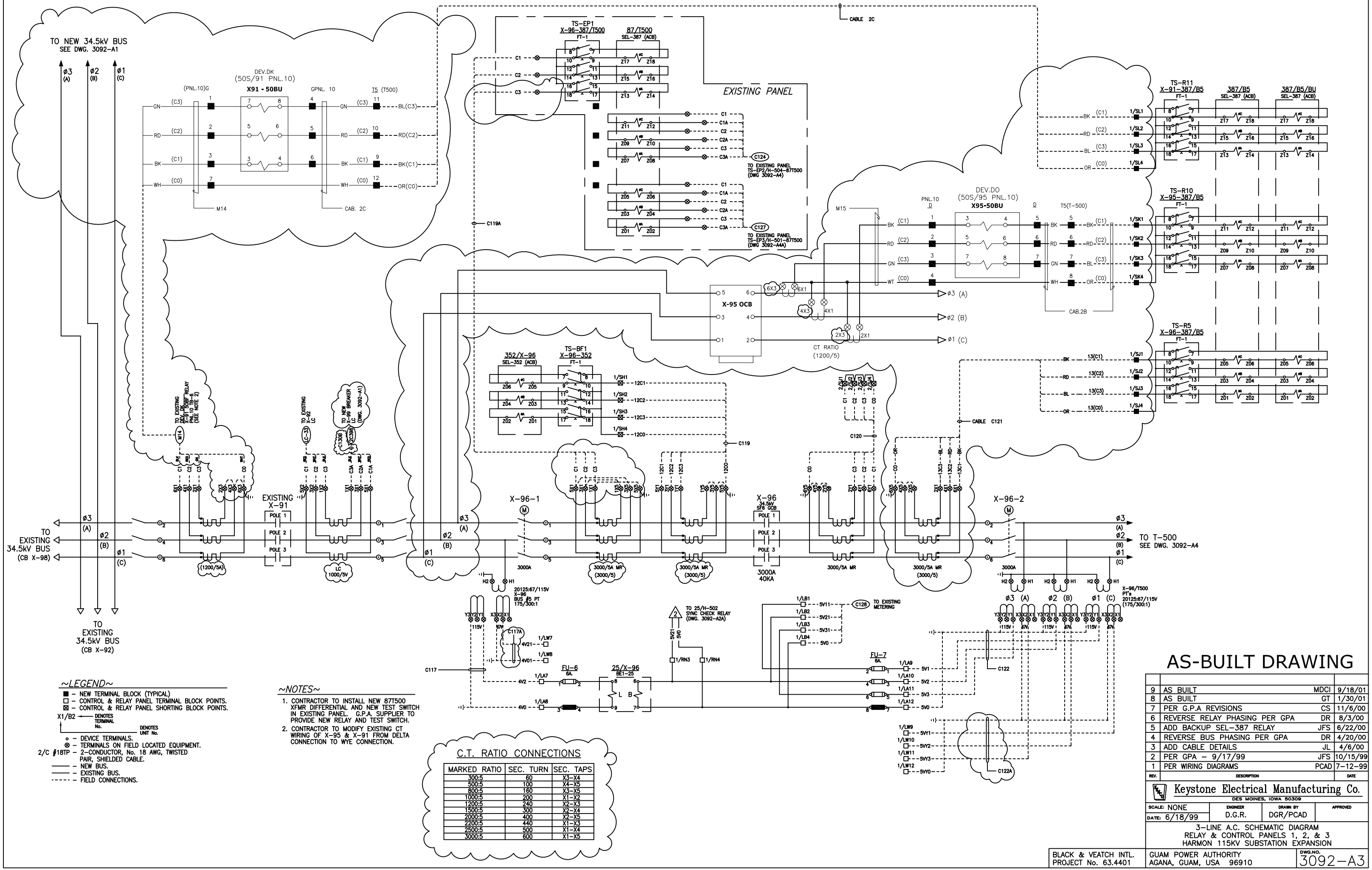
SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 10/14/99	D.G.R.	JFS	

3–LINE A.C. SCHEMATIC DIAGRAM
RELAY & CONTROL PANELS 1, 2, & 3
HARMON 115KV SUBSTATION EXPANSION

BLACK & VEATCH INTL.
PROJECT No. 63.4401

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092–A2A



~LEGEND~

- ■ – NEW TERMINAL BLOCK (TYPICAL)
- □ – CONTROL & RELAY PANEL TERMINAL BLOCK POINTS.
- ⊠ – CONTROL & RELAY PANEL SHORTING BLOCK POINTS.
- X1/B2 – DENOTES TERMINAL No. / DENOTES UNIT No.
- ○ – DEVICE TERMINALS.
- ⊗ – TERMINALS ON FIELD LOCATED EQUIPMENT.
- 2/C #18TP – 2-CONDUCTOR, No. 18 AWG, TWISTED PAIR, SHIELDED CABLE.
- —— – NEW BUS.
- —— – EXISTING BUS.
- ------ – FIELD CONNECTIONS.

~NOTES~

1. CONTRACTOR TO INSTALL NEW 87T500 XFMR DIFFERENTIAL AND NEW TEST SWITCH IN EXISTING PANEL. G.P.A. SUPPLIER TO PROVIDE NEW RELAY AND TEST SWITCH.
2. CONTRACTOR TO MODIFY EXISTING CT WIRING OF X-95 & X-91 FROM DELTA CONNECTION TO WYE CONNECTION.

C.T. RATIO CONNECTIONS

MARKED RATIO	SEC. TURN	SEC. TAPS
300:5	60	X3-X4
500:5	100	X4-X5
800:5	160	X3-X5
1000:5	200	X1-X2
1200:5	240	X2-X3
1500:5	300	X2-X4
2000:5	400	X2-X5
2200:5	440	X1-X3
2500:5	500	X1-X4
3000:5	600	X1-X5

AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
9	AS BUILT	MDCI	9/18/01
8	AS BUILT	GT	1/30/01
7	PER G.P.A REVISIONS	CS	11/6/00
6	REVERSE RELAY PHASING PER GPA	DR	8/3/00
5	ADD BACKUP SEL-387 RELAY	JFS	6/22/00
4	REVERSE BUS PHASING PER GPA	DR	4/20/00
3	ADD CABLE DETAILS	JL	4/6/00
2	PER GPA – 9/17/99	JFS	10/15/99
1	PER WIRING DIAGRAMS	PCAD	7-12-99

Keystone Electrical Manufacturing Co.
DES MOINES, IOWA 50309

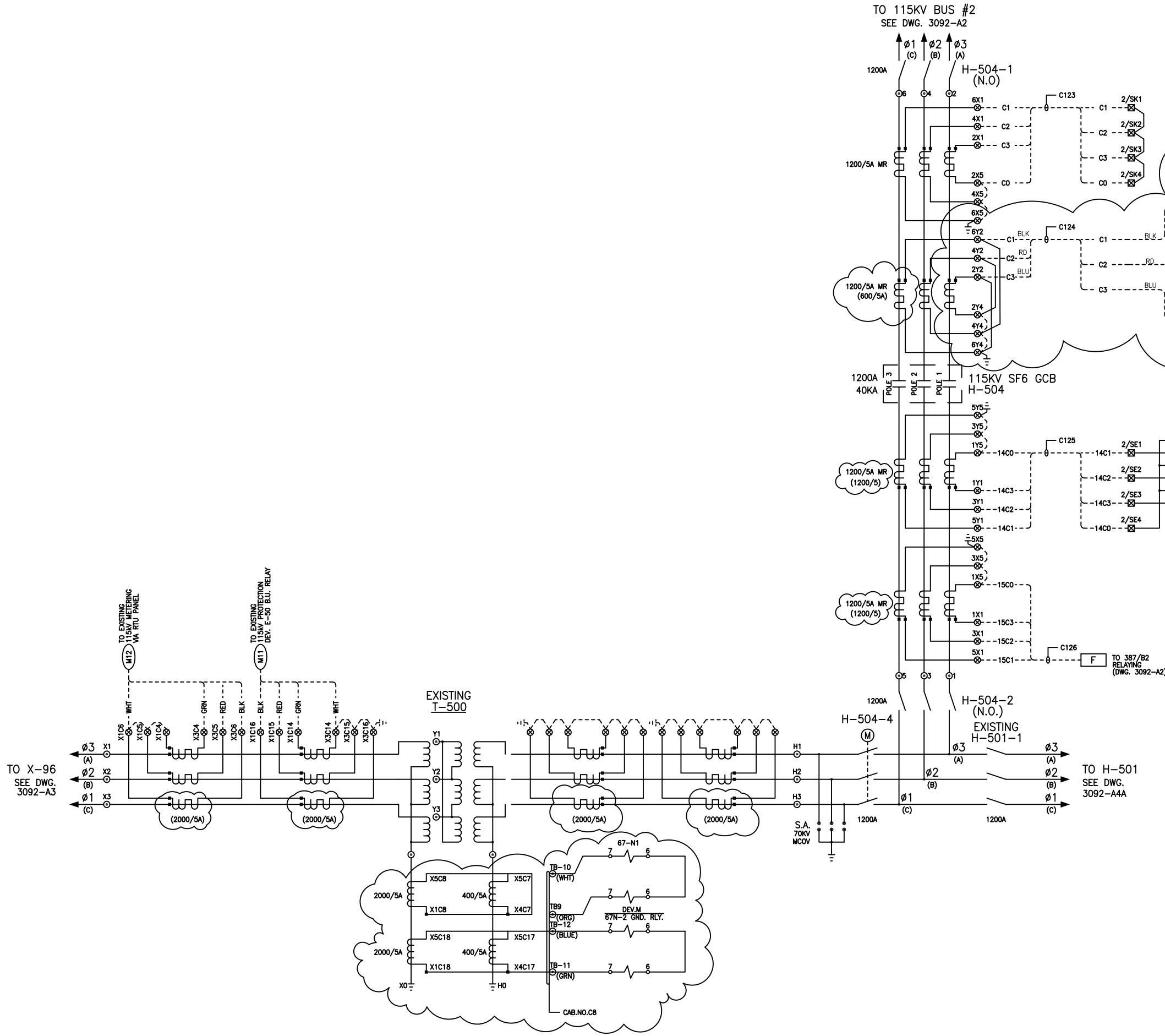
SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 6/18/99	D.G.R.	DGR/PCAD	

3-LINE A.C. SCHEMATIC DIAGRAM
RELAY & CONTROL PANELS 1, 2, & 3
HARMON 115KV SUBSTATION EXPANSION

BLACK & VEATCH INTL.
PROJECT No. 63.4401

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092-A3



C.T. RATIO CONNECTIONS

MARKED RATIO	SEC. TURN	SEC. TAPS
100:5	20	X2-X3
200:5	40	X1-X2
300:5	50	X1-X3
400:5	90	X4-X5
500:5	100	X3-X4
600:5	120	X2-X4
800:5	160	X1-X4
900:5	180	X3-X5
1000:5	200	X2-X5
1200:5	240	X1-X5

~LEGEND~

- □ – CONTROL & RELAY PANEL TERMINAL BLOCK POINTS.
- ⊠ – CONTROL & RELAY PANEL SHORTING BLOCK POINTS.
- X1/B2 ← DENOTES TERMINAL No. / DENOTES UNIT No.
- ○ – DEVICE TERMINALS.
- ⊗ – TERMINALS ON FIELD LOCATED EQUIPMENT.
- 2/C #18TP – 2-CONDUCTOR, No. 18 AWG, TWISTED PAIR, SHIELDED CABLE.
- ——— – NEW BUS.
- ——— – EXISTING BUS.
- - - - - – FIELD CONNECTIONS.

AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
8	AS BUILT	MDCI	9/18/01
7	AS BUILT	GT	1/30/01
6	PER G.P.A REVISIONS	CS	11/6/00
5	REVERSE RELAYING PHASING PER GPA	DR	8/3/00
4	REVERSE BUS PHASING PER GPA	DR	4/20/00
3	ADD CABLE DETAILS	JL	4/6/00
2	PER GPA – 9/17/99	JL	11/11/99
1	PER WIRING DIAGRAMS	PCAD	7-12-99

Keystone Electrical Manufacturing Co.
DES MOINES, IOWA 50309

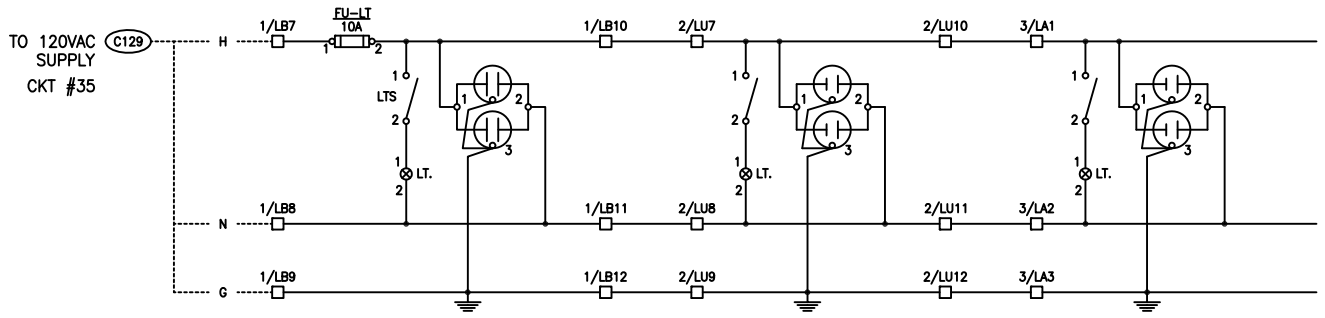
SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 6/18/99	D.G.R.	DGR/PCAD	

3-LINE A.C. SCHEMATIC DIAGRAM
RELAY & CONTROL PANELS 1, 2, & 3
HARMON 115KV SUBSTATION EXPANSION

BLACK & VEATCH INTL.
PROJECT No. 63.4401

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092-A4



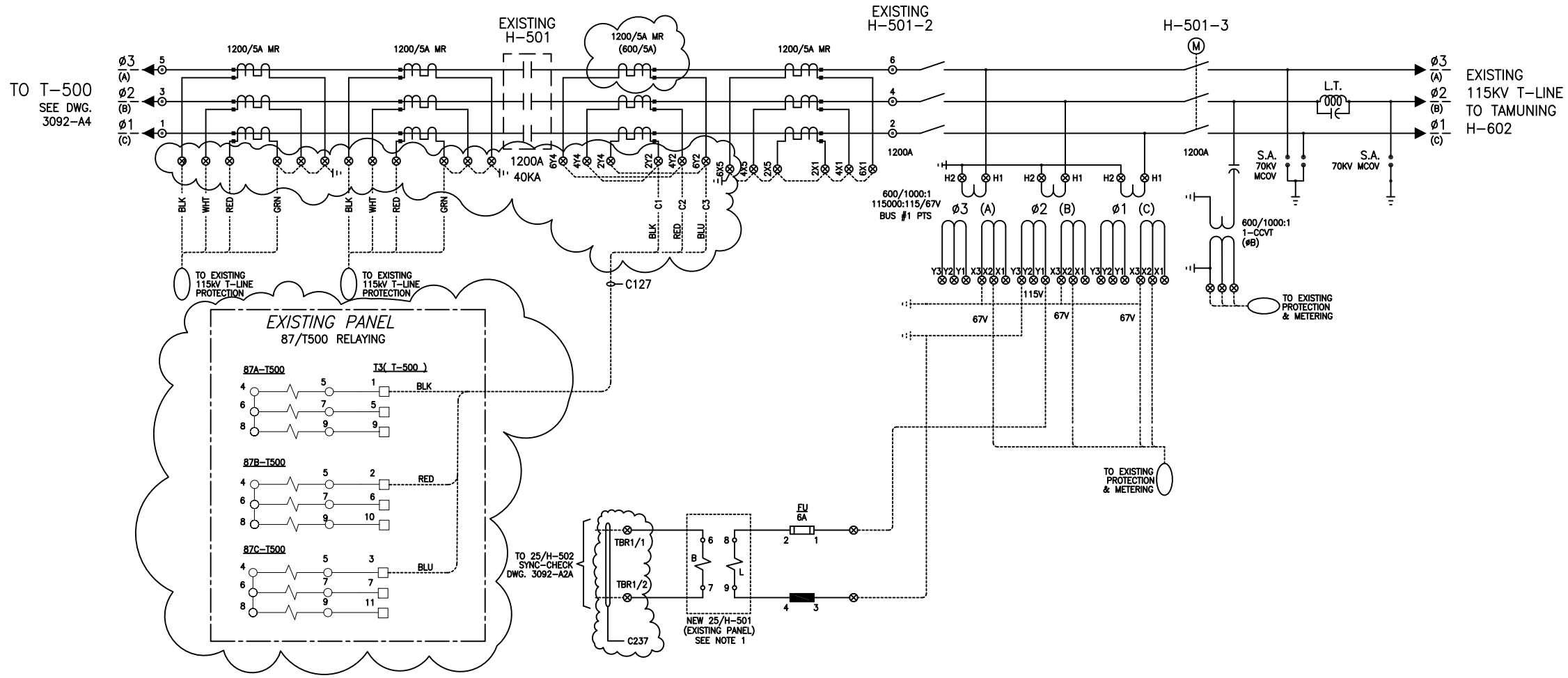
A.C. SERVICE CIRCUIT

~LEGEND~

- □ – CONTROL & RELAY PANEL TERMINAL BLOCK POINTS.
- ⊠ – CONTROL & RELAY PANEL SHORTING BLOCK POINTS.
- X1/B2 ← DENOTES TERMINAL No. / DENOTES UNIT No.
- ○ – DEVICE TERMINALS.
- ⊗ – TERMINALS ON FIELD LOCATED EQUIPMENT.
- 2/C #18TP – 2–CONDUCTOR, No. 18 AWG, TWISTED PAIR, SHIELDED CABLE.
- ——— – NEW BUS.
- ——— – EXISTING BUS.
- - - - - - - – FIELD CONNECTIONS.

C.T. RATIO CONNECTIONS

MARKED RATIO	SEC. TURN	SEC. TAPS
100:5	20	X2–X3
200:5	40	X1–X2
300:5	50	X1–X3
400:5	90	X4–X5
500:5	100	X3–X4
600:5	120	X2–X4
800:5	160	X1–X4
900:5	180	X3–X5
1000:5	200	X2–X5
1200:5	240	X1–X5



AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
9	AS BUILT	MDCI	9/18/01
8	AS BUILT	GT	1/30/01
7	PER G. P. A REVISIONS	GT	1/05/01
6	ADD A.C. SERVICE CIRCUIT	RAY	9/5/00
5	SEPARATE FROM DRAWING 3092–A4	DR	8/10/00
4	REVERSE BUS PHASING PER GPA	DR	4/20/00
3	ADD CABLE DETAILS	JL	4/6/00
2	PER GPA – 9/17/99	JL	11/11/99
1	PER WIRING DIAGRAMS	PCAD	7–12–99

Keystone Electrical Manufacturing Co.
DES MOINES, IOWA 50309

SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 6/18/99	D.G.R.	DGR/PCAD	

3–LINE A.C. SCHEMATIC DIAGRAM
RELAY & CONTROL PANELS 1, 2, & 3
HARMON 115KV SUBSTATION EXPANSION

BLACK & VEATCH INTL.
PROJECT No. 63.4401

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092–A4A

TO X-227
TUMON SUBSTATION

Ø 3 Ø 2 Ø1

BLACK
WHITE
RED

CAB. NO. LC31

6X1 4X1 2X1
6X2 4X2 2X2

157A

C3 C2 C1

34.5 KV UNDERGROUN LINE
TO X-103
TANGUISON POWER PLANT

Ø 3
Ø 2
Ø 1

1X1 1X2
3X1 3X2
5X1 5X2

X-93

C3 BLACK
C2 BLUE
C1 RED

#157B

X-99

2X2 2X1 C3
4X2 4X1 C2
6X2 6X1 C1

Ø 3(A)
Ø 2(B)
Ø 1(C)

C1A
C2A
C3A

#152A

BLACK
BLUE
RED

X-97

X-98

X-91

TO X-130
MACHECHE
SUBSTATION

Ø 3(A)
Ø 2(B)
Ø 1(C)

2X1 2X2
4X1 4X2
6X1 6X2

1X2 1X1 C3A
3X2 3X1 C2A
5X2 5X1 C1A

Ø 3 Ø 2 Ø1

X-94

X-92

CAB. NO.
LC 94292

TB "S"
PNL.9

DEV. DC
87A DIFF. RLY.

DEV. DB
87B DIFF. RLY.

DEV. DA
87C DIFF. RLY.

1 8 9
2 8 9
3 8 9

CAB. NO.
K17A

CAB. NO.
LC 942

RED
WHT.
BLK.

BLACK
WHITE
RED

CAB. NO. LC 33

LEGEND:

- ■ --- New Terminal Block
- □ --- Control & Relay Panel Terminal Block Points
- ○ --- Device Terminals
- ⊗ --- Terminals on Field Located Eqp't
- ------ --- Field Connections

NOTE:

EXISTING	*NEW*
Ø1 = RED	(RED)
Ø2 = WHITE	(BLUE)
Ø3 = BLACK	(BLACK)

AS-BUILT DRAWING

REV.	DESCRIPTION		DATE
9	AS BUILT	MDCI	9/18/01
8	AS BUILT	GT	1/30/01
7	PER G. P. A REVISIONS	GT	1/05/01
6	ADD A.C. SERVICE CIRCUIT	RAY	9/5/00
5	SEPARATE FROM DRAWING 3092–A4	DR	8/10/00
4	REVERSE BUS PHASING PER GPA	DR	4/20/00
3	ADD CABLE DETAILS	JL	4/6/00
2	PER GPA – 9/17/99	JL	11/11/99
1	PER WIRING DIAGRAMS	PCAD	7-12-99

Keystone Electrical Manufacturing Co.
DES MOINES, IOWA 50309

SCALE: NONE	ENGINEER	DRAWN BY	APPROVED
DATE: 6/18/99	D.G.R.	DGR/PCAD	

3–LINE A.C. SCHEMATIC DIAGRAM
RELAY & CONTROL PANELS 1, 2, & 3
HARMON 115KV SUBSTATION EXPANSION

BLACK & VEATCH INTL.
PROJECT No. 63.4401

GUAM POWER AUTHORITY
AGANA, GUAM, USA 96910

DWG.NO. 3092–A4B

Datasheets 031519

3.0 EQUIPMENT INSPECTED AND TESTED

.01 115KV & 34.5KV SWITCHGEAR

FIVE (5) AIR SWITCHES, CLEVELAND-PRICE,
V2-CA TYPE, 115KV, 1200A.

SIX (6) AIR SWITCHES, CLEVELAND-PRICE,
V2-CA TYPE, 34.5KV, 3000A.

ONE (1) CIRCUIT SWITCHER, S&C, 2010 TYPE,
115KV, 1200A.

THREE (3) POTENTIAL TRANSFORMERS,
TRENCH, UT5 TYPE, 66.4KV/ 69-120V.

EIGHT (8) POTENTIAL TRANSFORMERS,
TRENCH, UT5 TYPE, 20.1KV/ 69-120V.

TWO (2) CIRCUIT BREAKERS, ALSTOM,
DT-12 TYPE, 121KV, 1200A.

TWO (2) CIRCUIT BREAKERS, ALSTOM,
DT-09 TYPE, 38KV, 3000A.

ONE (1) CIRCUIT BREAKERS, ALSTOM,
DT-09 TYPE, 38KV, 1200A.

SIX (6) SURGE ARRESTERS,
70KV MCOV.

SIX (6) SURGE ARRESTERS,
22KV MCOV.

ONE (1) POWER TRANSFORMER,
TATUNG, SUBSTATION TYPE,
115KV–34.5KV, 112 MVA.

SEVENTY SIX (76) CURRENT TRANSFORMERS,
BUSHING TYPE, MULTI-RATIO.

FIVE (5) SUBSTATION BUS WORK SECTIONS.

ONE (1) SUBSTATION GROUNDING SYSTEM.

3.0 **EQUIPMENT INSPECTED AND TESTED**, CONT.

.02 **SUBSTATION RELAY AND CONTROL PANEL**

TWO (2) CONTROL PANEL SECTIONS,
KEYSTONE.

ONE (1) LINE DISTANCE RELAY, SCHWEITZER,
SEL-321-1 TYPE.

ONE (1) DIRECTIONAL OVERCURRENT RELAY,
SCHWEITZER, SEL-267 TYPE.

THREE (3) BUS DIFFERENTIAL RELAYS,
SCHWEITZER, SEL-387 TYPE.

FOUR (4) BREAKER FAILURE RELAYS,
SCHWEITZER, SEL-352 TYPE.

ONE (1) TRANSFORMER DIFFERENTIAL RELAY,
SCHWEITZER, SEL-587 TYPE.

ONE (1) DUAL OVERCURRENT RELAY,
SCHWEITZER, SEL-501 TYPE.

THREE (3) SYNC-CHECK RELAYS,
BASLER, BE1-25 TYPE.

TWO (2) ELECTRONIC CIRCUIT MONITORS
BITRONICS.

ONE (1) SUBSTATION ANNUNCIATOR PANEL.

ONE (1) SUBSTATION BATTERY / CHARGER SYSTEM.

SPECIFICATION FOR TRANSFORMER

1.TYPE:Three winding,oil-immersed OA/FA/FOA Cooled, Outdoor use,type form OA/FA/FOA

2.SERVICE CONDITIONS:

The equipment supplied here under shall be installed at an altitude below 1,000 meters above sea level,and maximum ambient temperature does not exceed 45 ℃.

3.RATING

3-1 Phase three

3-2 Frequency 60 Hz

3-3 Capacity 80000/100000/112000 KVA

3-4 Primary rated voltage 115000 V (between lines) 4 Bushings
66395 V (between phase and neutral)

3-5 Secondary rated voltage 34500 V (between lines) 4 Bushings
19919 V (between phase and neutral)

3-6 Tertiary rated voltage 13800 V (between lines) 3 Bushings

3-7 Primary tap voltage(on load tapchange)
Full capacity 115000±2×2.5%,34500±16×0.625% V

3-8 Phase sequence YNyndl

3-9 Connection Primary Y Secondary Y Tertiary △

3-10 Stabilizing winding shall be provided.

4.DIELECTRIC STRENGTH:

The transformer shall be designed,tested and constructed to withstand the induced voltage, the applied voltage and impulse voltage in accordance with the recommendation of ANSI C57.1 ,as follows.

4-1 Induced voltage test
Test in according with ANSI C57.12 standard.

4-2 Applied voltage test (1 minute)
Primary winding 230 KV Secondary winding 70 KV Tertiary winding 34 KV
Primary neutral 34 KV Secondary neutral 34 KV

4-3 Impulse Test
Primary winding 550 KV Secondary winding 200 KV Tertiary winding 110 KV
Primary neutral 110 KV Secondary neutral 110 KV

5.TEMPERATURE RISE

5-1 Winding: Average winding temperature rise measured by resistance method shall not exceed 65 ℃.

5-2 Oil: Maximum oil temperature rise measured by thermometer method shall not exceed 65 ℃

6.TRANSFORMER OIL

The transformer shall be delivered filled with normal quantity of insulation oil of ASTMD348

7.FACTORY PERFORMANCE TEST

The transformer shall be tested as follows prior to be delivered at manufacturing works.

7-1 Resistance measurement
7-2 Ratio test
7-3 Polarity test or phase sequence test
7-4 No load(Iron)loss test
7-5 Load(Copper)loss test
7-6 No load current test
7-7 Impedance test
7-8 Induced voltage test
7-9 Applied voltage test
7-10 Impulse Test (Type test)
7-11 Temperature Rise Test (Type test)
7-12 Audible sound level test (Type test)

Detailed test report based on our performance test shall be submitted.

	Fans	Pumps
Number, each cooler/ radiator	10(total)	2
Horsepower, each motor	1/4	send later
Volts (Line-to-Line)	240	240
Number of phases	1	1
Full load current, each motor, amperes	1.6	11.5

Power requirements for load tap charger, kW — 1

Maximum expected calculated audible sound level at maximum 65 C (____ MVA) rating, according to NEMA TR 1, decibels for each stage of cooling — Please refer to comment 1. (80 MVA BASE) (112 MVA BASE) @ 1 foot 79 dB @ 6 feet 82 dB

	Manufacturer	Type
Bushings		
High voltage	~~ABB or equivalent~~ ABB	condenser
Low voltage	~~ABB or equivalent~~ ABB	condenser
Neutral	~~ABB or equivalent~~ ABB	condenser
Tertiary	~~ABB or equivalent~~ ABB	condenser
Current transformers		
High voltage	TATUNG	bushing type
Low voltage	TATUNG	bushing type
Neutral	TATUNG	bushing type
Tertiary	TATUNG	bushing type

HARMON 115/34.5 KV PWR XFMR 63.3801
00300-5

Comment 1. The microphone shall be spaced 0.3 m from the reference sound-producing surface. When fans are in operation, the microphone shall be located 2 m from any portion of the radiators, coolers, or cooling tubes cooled by forced air. (IEEE Std C57.12.90-1993)

8.STANDARD

The transformer shall be designed,manufactured and tested in accordance with ANSI C57.12 standard.

9.CHARACTERISTICS (AT 85℃)

Test tap Primary 115000 V Secondary 34500 V

Capacity (KVA)	Efficiency (%)				Regulation(%)		No load current (%)
	Full load	3/4 load	1/2 load	1/4 load	100% P.F.	80% P.F.	
112000	99.65	99.71	99.75	99.73	1.20	8.80	0.50

Capacity (KVA)	Load loss (W)	No load loss (W)	Total loss (W)	Impedance (%)	Noise (dB)
112000	339000	54000	393000	13.3	82

Note:Tolerance of electrical performance shall comply with ANSI C57.12

10.OUTLINE DRAWING NO.,TOTAL WEIGHT AND DIMENSIONS.(APPROX. VALUE)

Capacity (KVA)	Outline drawing NO.	Dimensions (in)			Weight (lb)
		A	B	C	
80000/100000/112000	452-04276	402	246	278	366000

11.CONSTRUCTION:Referance HIE-002089

The oil preservation system is N type

~~SUPPLEMENTAL SERVICES~~. The following adjusting prices will be used to adjust the contract amount for any requested technical service representatives' time (reference Section 1A). The per diem price indicated shall NOT include international travel expense:

Per diem at the site of the work - Dededo, Guam _____

Overtime hourly rate at the site of the work, Dededo, Guam _____

One round trip transportation price per representative _____

115/34.5 KV POWER TRANSFORMER

Manufacturer — TATUNG

Cooling class and temperature rise — OA/FA/FOA, 65°C

Continuous kVA without cooling equipment in operation — 80000

Type of coil and core construction — core type

Impedance at nominal voltage connection, based on 65 C OA (~~80~~ 112 MVA) rating, percent

重設 88.8.9 林慈欽

H to X — ~~9.5~~ 13.3

H to Y — about ~~19~~ ~~19~~ 23.8 重設 88.6.15 林慈欽 重設 88.8.9 林慈欽

X to Y — about ~~9~~ ~~6~~ 8.4

Guaranteed efficiency, at the following percentages of maximum 65 C (~~80~~ 112 MVA) rating, percent

重設 88.8.9 林慈欽

125 percent — ~~99.68~~ 99.58

100 percent — ~~99.72~~ 99.65 重設 88.8.9 林慈欽

75 percent — ~~99.75~~ 99.71

~~50 percent~~	~~99.15~~	99.15
25 percent	~~99.68~~	99.73

Voltage regulation, at 100 percent of maximum 65 C (~~80~~ 112 MVA) rating, percent

100 percent power factor	~~0.67~~ ~~0.7~~	1.2
90 percent lagging power factor	~~4.70~~ ~~5~~	6.8
80 percent lagging power factor	~~6.16~~ ~~6.5~~	8.8

Excitation current, at 100 percent rated voltage, based on maximum 65 C (~~80~~ 112 MVA) rating, percent ~~0.7~~ 0.5

Guaranteed losses at 100 percent rated voltage

	kVA	kW
No load losses	~~80000~~ 112000	54
Total losses	~~80000~~ 112000	~~227~~ 393

Note: Load losses = (Total losses) - (no load losses)

Auxiliary losses (cooling equip, etc.) at maximum 65 C (112 MVA) rating	112000	6.1
Guaranteed no-load loss at 110%	~~80000~~ 112000	77

Guaranteed power requirements of cooling equipment, kW

	Fans	Pumps	Total
First stage of cooling	2.4	N.A.	2.4
Second stage of cooling	3.6	2.5	6.1

Cooling equipment

Number of coolers/radiators	10 ~~8~~ sets

Surge arresters

High voltage

Manufacturer	ABB ~~or equivalent~~
Type	station
Arrester Rating (Duty Cycle) kVrms	90
Maximum Continuous Operating Voltage (MCOV) kV	72
One second TOV capability, kVrms	104
Creepage distance, inches	~~149~~ 182
Weight, pounds (each unit)	~~196~~ 198

Low voltage

Manufacturer	ABB ~~or equivalent~~
Type	station
Arrester Rating (Duty Cycle) kVrms	~~27~~ 36
Maximum Continuous Operating Voltage (MCOV) kV	~~22~~ 29
One second TOV capability, kVrms	~~31~~ 41.4
Creepage distance, inches	56
Weight, pounds (each unit)	97

Tertiary

Manufacturer	ABB ~~or equivalent~~
Type	station
Arrester Rating (Duty Cycle) kVrms	~~12~~ 11.3
Maximum Continuous Operating Voltage (MCOV) kV	~~10.2~~ 9.0
One second TOV capability, kVrms	~~13.8~~ 11.8
Creepage distance, inches	25
Weight, pounds (each unit)	~~35~~ 10
Remote tap position indicator, selsyn-type	yes

88.6.15 林嶽欽

Load tap changer

Manufacturer	ABB ~~or equivalent~~
Type	UCG ~~(ref. only)~~
Current rating, amperes	600
Number of operations until first maintenance (also provide contact curve)	ref. contact life curve
Type of oil preservation system	Nitrogen gas sealed type (N type) ref. HIE-0030-92
Is vacuum filling required?	yes

建設 88.6.15 林嶽欽

Harmon 115 kV Short Circuit

Summary of fault being displayed:
Prefault voltage: From a linear network solution
Generator impedance: Subtransient
MOV iteration: [Off]
Enforce generator current limit [A]
ANSI x/r ratio calculation [Off]

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==========

1. Bus Fault on: 1201 Harmon Bus 2 115. kV 3LG

FAULT CURRENT (A @ DEG)

+ SEQ	- SEQ	0 SEQ	A PHASE	B PHASE	C PHASE
5938.2@ -58.2	0.0@ 0.0	0.0@ 0.0	5938.2@ -58.2	5938.2@-178.2	5938.2@ 61.8

THEVENIN IMPEDANCE (OHM)

0.957+j11.0305 0.94997+j11.1078 0.7953+j5.42896

SHORT CIRCUIT MVA= 1195.8 X/R RATIO= 11.5262 R0/X1= 0.0721 X0/X1= 0.49218

BUS 1201 Harmon Bus 2 115.KV AREA 2 ZONE 1 TIER 0 (PREFAULT V=1.011@ 27.4 PU)

	+ SEQ	- SEQ	0 SEQ	A PHASE	B PHASE	C PHASE
VOLTAGE (KV, L-G) >	0.000@ 0.0	0.000@ 0.0	0.000@ 0.0	0.000@ 0.0	0.000@ 0.0	0.000@ 0.0
BRANCH CURRENT (A) TO >						
0 Harmon Bus 1 115. L	3281.1@ 122.9	0.0@ 0.0	0.0@ 0.0	3281.1@ 122.9	3281.1@ 2.9	3281.1@-117.1
0 PITI 115. L	1780.4@ 122.8	0.0@ 0.0	0.0@ 0.0	1780.4@ 122.8	1780.4@ 2.8	1780.4@-117.2
0 Harmon Bus 3 34.5 2X	882.1@ 115.9	0.0@ 0.0	0.0@ 0.0	882.1@ 115.9	882.1@ -4.1	882.1@-124.1
0 T-501 13.2 2X						
CURRENT TO FAULT (A) >	5938.2@ -58.2	0.0@ 0.0	0.0@ 0.0	5938.2@ -58.2	5938.2@-178.2	5938.2@ 61.8
THEVENIN IMPEDANCE (OHM) >	11.072@ 85.0	11.1484@ 85.1	5.48691@ 81.7			

Summary of fault being displayed:
Prefault voltage: From a linear network solution
Generator impedance: Subtransient
MOV iteration: [Off]
Enforce generator current limit [A]
ANSI x/r ratio calculation [Off]

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==========

2. Bus Fault on: 1201 Harmon Bus 2 115. kV 1LG Type=A

FAULT CURRENT (A @ DEG)

+ SEQ	- SEQ	0 SEQ	A PHASE	B PHASE	C PHASE
2390.9@ -57.4	2390.9@ -57.4	2390.9@ -57.4	7172.6@ -57.4	0.0@ 0.0	0.0@ 0.0

THEVENIN IMPEDANCE (OHM)

0.957+j11.0305 0.94997+j11.1078 0.7953+j5.42896

SHORT CIRCUIT MVA= 1444.4 X/R RATIO= 10.2015 R0/X1= 0.0721 X0/X1= 0.49218

BUS 1201 Harmon Bus 2 115.KV AREA 2 ZONE 1 TIER 0 (PREFAULT V=1.011@ 27.4 PU)

	+ SEQ	- SEQ	0 SEQ	A PHASE	B PHASE	C PHASE
VOLTAGE (KV, L-G) >	40.242@ 26.9	27.143@-151.8	13.118@-155.7	0.000@ 0.0	60.559@ -81.5	62.589@ 135.7
BRANCH CURRENT (A) TO >						
0 Harmon Bus 1 115. L	1312.5@ 122.7	1324.1@ 124.4	1263.7@ 122.9	3900.0@ 123.3	88.3@ -53.4	32.4@ -6.6
0 PITI 115. L	718.9@ 126.6	720.8@ 121.5	316.9@ 121.4	1754.9@ 123.6	347.4@ -53.7	458.4@ -53.8
0 Harmon Bus 3 34.5 2X	364.9@ 114.5	347.7@ 118.2	810.3@ 122.7	1520.2@ 119.7	435.6@ 126.3	481.0@ 129.0
0 T-501 13.2 2X						
CURRENT TO FAULT (A) >	2390.9@ -57.4	2390.9@ -57.4	2390.9@ -57.4	7172.6@ -57.4	0.0@ 0.0	0.0@ 0.0
THEVENIN IMPEDANCE (OHM) >	11.072@ 85.0	11.1484@ 85.1	5.48691@ 81.7			
