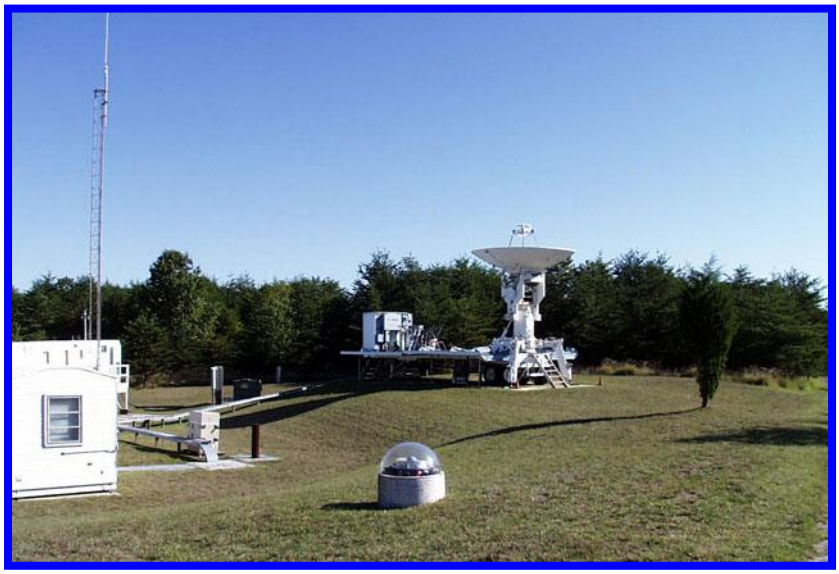
NSLR-06-0009

GREENBELT

GODDARD GEOPHYSICAL AND ASTRONOMIC OBSERVATORY

CO-LOCATION SURVEYS

REPORT



Dates of Surveys: **2001 –to- 2003**
Date of Report: **December 5, 2008**
By: **Jim Long and Troy Carpenter**

Table of Contents

1. Introduction

The realization of the International Terrestrial Reference Frame (ITRF) is a product of the International Earth Rotation and Reference Frames Service (IERS) International Terrestrial Reference System (ITRS) Product Center. The ITRS is a world-wide spatial reference system providing a common reference frame for points on the surface of the Earth. At the time of this survey, the current realization was ITRF2000. The ITRF2000 point coordinates are obtained by the combination of individual TRF solutions computed from the observations of the different space geodesy techniques: Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR), Global Positioning System (GPS), and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) located at sites distributed around the whole Earth. Two very important components of this combination of space geodesy solutions are the co-location site, where multiple space geodesy techniques are located in close proximity, and the local tie survey, which provides an accurate ground connection between the different space geodesy systems.

This report describes the co-location survey conducted at the Goddard Geophysical and Astronomic Observatory (GGAO) Greenbelt site, and presents the results of the adjustment and analysis.

2. Acknowledgements

The co-location survey of the Goddard Geophysical and Astronomical Observatory and subsequent report and analysis was performed by Honeywell Technology Solutions Incorporated (HTSI) for the NASA Satellite Laser Ranging program. This survey effort benefited greatly from the cooperation and support of the operational personnel from the VLBI MV3 and the SLR MOBLAS 7 at the GGAO, and the cooperation and support of all the IERS services: International VLBI Service (IVS), International Laser Ranging Service (ILRS), International GNSS Service (IGS), and International DORIS Service (IDS).

3. GGAO Site Description

The GGAO is a large multi-functional facility located near Greenbelt, Maryland, about 12 miles northeast of Washington D.C. The site is owned and operated by the NASA Goddard Space Flight Center (GSFC) for research and development of space geodesy technology, especially laser ranging, laser communications, and VLBI equipment. The GGAO is an important co-location site with four space geodesy techniques:

a. VLBI
b. SLR
c. GPS
d. DORIS

The local survey control network at GGAO consists of a large number of stable, inter-visible ground monuments and concrete pillars. The concrete pillars are equipped with stainless steel self-centering fixtures or stainless steel plates with a 5/8”-11 threaded stud to accept standard survey tribrachs.

3.1 GGAO Site History

GGAO has been host to the mobile VLBI system MV3 since 1989. In 1992, the mobile, trailer-mounted MV3 antenna was installed in its current location on a newly constructed concrete pad for Station 7108. The trailer-mounted MV3 was operated as a fixed antenna. In late 2002, the MV3 antenna was removed from the trailer and permanently fixed to the concrete pad at Station 7108 in mid-2003.

GGAO has been the host to the development of several generations of SLR systems, starting in the late 1960s and a Lunar Laser Ranging (LLR) system for measuring to retroreflectors on the moon. MOBLAS 7 was installed in its current location at Station 7105 in 1981. GGAO has also hosted numerous other SLR systems, visiting from other countries, for inter-comparison testing.

GGAO has been host to GPS systems since 1992, with the installation of two JPL FLINN-type concrete piers and the first GPS receiver. The two piers are in close proximity to each other, designated GODE and GODW, to facilitate precise testing of GPS antennas and receivers.

GGAO has been host to DORIS starting in June 2000. The location of the DORIS pier, at the southern end of GGAO, was selected so that Building 201 would provide masking to prevent the transmitted RF signals from interfering with the MV3 VLBI antenna receiver.

The NASA/GSFC geodetic survey program was started in the late 1970s to support the on-going operations, development, and co-locations of the space geodesy systems at GGAO and at many other NASA/GSFC-supported sites around the world. The NASA/GSFC survey personnel have been actively working to refine their methods and procedures and utilize the most precise survey equipment and software tools to keep pace with the improving accuracies of the space geodesy techniques.

GGAO has been an important site for the space geodesy ties to the precise horizontal and vertical control networks of the U. S. National Geodetic Survey. The NASA/GSFC survey program has provided support to this effort through the years.

3.2 VLBI Station – DOMES Number: 40451M125

This station refers to the ground survey mark, designated 7108, under the base of the VLBI antenna pedestal. The survey mark is a standard 100 mm diameter brass disk set in a 300 mm diameter concrete pier, set flush with and isolated from the concrete pad for the VLBI antenna. The VLBI antenna is named MV3 (IVS designation: GGAO7108). MV3 consists of a 5 m diameter dish with an Az/El mount.

The conventional reference point for the VLBI antenna is the intersection of the horizontal axis of rotation projected onto the vertical axis of rotation. This conventional reference point is not accessible and cannot be measured directly. The VLBI reference point is horizontally and vertically offset (or eccentric) from the 7108 station survey mark.

Until late in 2002 the MV3 antenna was mounted on a mobile trailer in a transportable configuration. See Figure 1. The trailer was located on the concrete pad such that the MV3 antenna conventional reference point was approximately centered above the 7108 survey mark. The eccentricities were measured by MV3 operators utilizing their usual methods developed for the mobile VLBI operations. For this method a small red laser is mounted vertically in a permanent housing inside the top of the antenna pedestal (above the azimuth bearing), approximately parallel with the vertical axis of rotation. When the antenna is rotated in azimuth, the laser beam scribes a small circle (because the laser is slightly offset from and/or not parallel

with the vertical axis of rotation) upon a mylar recording sheet placed on a special leveling-plate assembly with a center spike on the survey mark. The center of the circle represents the planimetric location of the vertical axis of rotation, offset from the center point on the special plate. Then a height from the survey mark to a fixed-height reference point on the antenna pedestal is measured to determine the altimetric location of the elevation axis of rotation.

Figure 1. Global View of VLBI 5-meter Antenna in Transportable Configuration

In mid-2003 the MV3 antenna pedestal was refurbished and installed on a cylindrical steel riser and permanently mounted in a fixed configuration. The base of the steel riser is fixed on steel anchor bolts imbedded in the concrete pad. See Figure 2. The MV3 conventional reference point is approximately centered above the 7108 survey mark. The eccentricities were measured by MV3 operators utilizing the same methods as developed for the mobile VLBI operations and described previously in the above paragraph.

The MV3 eccentricity values are also determined during the co-location survey work.

Figure 2. Global View of VLBI 5-meter Antenna in Fixed Configuration

3.3 SLR Station – DOMES Number: 40451M105

This station refers to the ground survey mark, designated 7105, beneath the SLR telescope. The survey mark is a standard NASA 100 millimeter (mm) diameter brass disk set flush in the large concrete foundation for the SLR mount.

The SLR is a transportable system named MOBLAS 7 (ILRS designation: GODL). The system consists of a 0.76 meter (m) telescope on an azimuth/elevation (Az/El) mount supported and leveled on three adjustable jack-screw legs, isolated from the mobile trailer enclosure. The trailer has a roll-back roof and sides that can be lowered to expose the SLR telescope. The foundation for the mobile trailer is separate and isolated from the foundation for the SLR telescope mount.

The conventional reference point for the SLR telescope is the intersection of the horizontal and vertical axes of rotation. This conventional reference point is not accessible and cannot be measured directly. The SLR conventional reference point is approximately centered above the 7105 from the station mark. The horizontal and vertical eccentricities are determined by survey methods. See Figure 3.

Figure 3. Global View of SLR Telescope and Trailer

3.4 GPS Station – DOMES Number: 40451M123

This station refers to the drill hole at the center of a 457 mm diameter stainless steel plate, set in the top of a 0.76 m diameter concrete pier. The concrete pier projects 0.4 m above the ground. The steel plate is inscribed "JPL 4006 -1992".

The GPS station is designated GODE by the IGS and it is an IGS Reference Frame station. The GODE antenna is a JPL Dorne/Margolin element choke ring installed on a JPL-designed steel mount fixture with a fixed-height center spike. GODE has a JPL-type clear plastic hemispherical radome. See Figure 4. According to the IGS GODE site log, the height of the GODE antenna reference point (ARP) is 0.0614 m above the station mark.

Figure 4. GPS GODE antenna on pier monument

3.5 DORIS Antenna – DOMES Number: 40451S176

The DORIS station is designated GREB by the IDS and the station refers to the GREB antenna reference point. The GREB antenna is mounted on a stainless steel plate fixture attached to the top of a 300 mm diameter reinforced concrete pillar. See Figure 5. The DORIS pillar survey mark is the intersection of the centerline of the 5/8”-11 threaded stud and the top of the stainless steel plate, flush with the top of the concrete pillar. The height of the GREB antenna reference point above the pillar survey mark is 0.518 m.

The conventional reference point for the DORIS antenna is defined as the projection of the 2 GHz phase center (located at the mid-point of the narrow end of the antenna) on the plane containing the red circle (located at the mid-point of the wide part of the antenna).

Figure 5. DORIS GREB antenna on the pillar monument

3.6 Main Survey Monument – North GEOS Pier

This station refers to the main survey monument at the Greenbelt site and it is designated North GEOS Pier (PID: JV5895). North GEOS Pier is a Federal Base Network Control Station of the National Geodetic Survey (NGS). The station mark is the center point of a standard 100 mm GSFC brass disk set in the top of a triangular concrete pier, 0.9 m on a side. The top of the concrete pier is 0.6 m above the ground. See Figure 6.

Figure 6. North GEOS Pier monument

4. Survey Description

4.1 Organization

The survey work was completed by Honeywell surveyors Jim Long, Nagendra Paudel, and Troy Carpenter, under a NASA contract. The majority of the survey data was collected during periodic efforts in the years 2001 through 2003, as part of a comprehensive survey project to determine the local ties for the co-located space geodesy systems at GGAO and the survey ground control network. The survey data for the DORIS pier was collected in February 2000. The continuity of this survey effort at GGAO was often interrupted by higher priority survey objectives.

4.2 Instruments and Equipment

All of the survey instruments and equipment utilized for this project are owned by NASA and administered by Honeywell under NASA GSFC contract.

The following are the most important survey instruments:

a. Leica electronic theodolites T3000 and T2002, with angular accuracy standard deviation of 0.5 seconds, were used to measure horizontal and vertical angles.

b. Three Leica electronic distance measurement (EDM) instruments DI2000 (two) and DI2002 (one), with an accuracy standard deviation of 1 mm + 1 ppm, were used to measure slope distances.

c. Leica electronic level instruments NA2000 and NA3003, with an accuracy standard deviation of 1.5 mm and 1.2 mm, respectively, were used for the differential level measurements.

d. Four Trimble 4000SSE receivers with Trimble choke ring antennas, with a horizontal accuracy standard deviation of 5 mm + 1 ppm and a vertical accuracy standard deviation of 10 mm + 1 ppm, were used for GPS observations.

Other useful equipment and accessories included:

a. Leica optical plummet.

b. Wild T-2 Targets.

c. Tripods.

d. Trivet plates, tribrachs, and tribrach adapters.

e. Calibrated 40 mm mini-prisms.

f. Translation stages.

g. Special target rods and fixing brackets.

The calibration constants for the EDM instruments were calculated from measurements on the calibration baseline established at the NGS Corbin facility. The distance measurement targets were corner cube prisms previously calibrated at the NGS Corbin facility.

4.3 Survey Network and Strategy

The survey strategy was developed, utilizing the extensive network of existing survey ground control monuments, with a goal of 1 mm accuracy in each coordinate direction, and conducted with the high-precision methods and equipment to achieve this goal. As much as possible, the instruments were set on concrete pillars with self-centering fixtures or imbedded steel plates with 5/8”-11 threaded studs to ensure stability and eliminate plumbing errors. A Wild NL precise optical plummet was used for all tripod setups to minimize plumbing errors.

All inter-visible lines-of-sight between survey stations were observed. Refer to the diagram in Appendix H. Horizontal directions were observed in sets of 4 observations, with each observation consisting of a pointing in both direct and reverse telescope positions. Zenith distances were observed in sets of 3 observations, with both direct and reverse telescope pointings. Observations were rejected and then repeated if the observation value was greater than 5 seconds from the mean value of the set of observations.

Distance measurements were observed from each station standpoint with two different EDM instruments to all inter-visible target points. As a result, the effective measurement of each line

was repeated a total of 4 times (two each way). Atmospheric pressure and temperature data were recorded at the beginning and end of each distance observation period.

Direct differential levels were observed to determine orthometric height differences between the survey stations in the control network. All observations were double run: forward run and backward run and with a third run completed if the difference between the forward run and backward run was greater than 1 mm.

All of the survey observations, except for GPS, were recorded by hand on the appropriate Honeywell survey data form. The GPS observations were recorded electronically on the internal memory of the Trimble receiver and subsequently downloaded for post-processing.

4.4 VLBI Antenna Conventional Reference Point Observations

The conventional reference point for the VLBI antenna is defined by the intersection point of the horizontal axis of rotation projected onto the vertical axis of rotation and the perpendicular offset distance between the horizontal axis and the vertical axis. So, the determination of the VLBI conventional reference point is accomplished by separately determining each axis of rotation. In general, the method to determine an axis of rotation is to observe a target fixed on the antenna from ground control points while the antenna is systematically rotated about that axis only.

For MV3, the 5 meter antenna positioner pedestal is manufactured as unit, with tolerances typically expected for precisely machined parts. It is assumed that the horizontal rotation axis and the vertical rotation axis intersect and the horizontal axis offset distance is equal to 0.000 m.

This report covers two independent VLBI antenna surveys. The first survey was conducted in the fall of 2002, to "close-out" the VLBI observation period with MV3 mounted on the mobile trailer. The second survey was conducted in the fall of 2003 to "start" the VLBI observation period after the MV3 antenna had been refurbished and installed on the fixed pedestal riser. However, the methods utilized are similar for both surveys and thus the descriptions will not be repeated where the similarities exist.

A special target rod, with a 3 mm diameter spherical target at one end, was temporarily fixed at the apex of the antenna quadripod structure, such that the view of the target would be the least obstructed; and visible from the most ground control points for the longest period of arc of the antenna motion. See Figure 7.

Figure 7. VLBI Antenna Apex Target

For both the 2002 survey and the 2003 survey, the following VLBI antenna observations were completed over a period of 2 days each. For the first set of observations, the VLBI antenna controller was placed in manual control and was oriented to 000 degree azimuth (+/- 0.01 degree). Due to potential pointing offsets between the electrical radio frequency (RF) pointing and the mechanical pointing of the antenna, it is necessary to verify the accuracy of the digital azimuth readout on the antenna controller to the true azimuth and then account for any offset.

The VLBI antenna was then rotated in elevation (about the horizontal axis of rotation) to a starting point of 10 degrees above the horizon. The VLBI antenna was held in this position by turning the antenna servo drive controller to stand-by. Next, the target was located by forward intersection methods by observing horizontal directions and zenith distances (two sets each) from all the surrounding ground control network stations that had visibility. Next, the VLBI antenna was systematically rotated in 15 degree increments about the elevation axis to a maximum 165 degrees pointing angle, stopping for survey observations at each increment. The antenna target points scribe an arc in a plane orthogonal to the elevation axis of rotation.

This initial process was repeated once more at antenna azimuth positions of 090 degrees. During the 2003 survey, at each of the two azimuth positions, the antenna target was observed with the antenna at zenith (90 degree elevation position) to provide a point of comparison between the two different arcs. To ensure the best accuracy the forward intersection observations were completed from at least three ground control stations, and sometime from four ground control stations. However, because of site terrain constraints in the ground survey control network, sometimes the antenna target was only visible from two ground stations.

During the 2002 MV3 antenna survey a different method was utilized. For this alternate method, two special target rods (color-coded orange and green) were temporarily fixed to the metal housings near each end of the elevation axis. See Figures 8 and 9. The antenna was systematically rotated in azimuth about the vertical axis of rotation, stopping for observations at 30 degree increments. Both of the target rods are located by forward intersection methods by observing horizontal directions and zenith distances (two sets each) from all the surrounding ground control network stations that had visibility. The antenna is rotated 30 more degrees and the observations repeated, until each target scribed a complete circle.

Figure 8. VLBI Antenna Elevation Axis Targets

Figure 9. Close View of VLBI Antenna Elevation Axis Target

4.4.1 VLBI Conventional Reference Point Eccentricities

The eccentricities from the 7108 station survey mark to the VLBI conventional reference point are computed from the results of the least-squares adjustment of the survey observation data.

4.5 SLR Conventional Reference Point Observations

The conventional reference point for the SLR telescope was determined in two separate steps. The first step determined the location of the vertical axis of rotation relative to a horizontal plane at the top of the mount. The second step determined the height difference from the horizontal plane to the horizontal axis of rotation.

To begin the first step for MOBLAS 7, the SLR telescope is inverted and leveled with a carpenter's level (i.e., at the 180 degree telescope elevation angle position) to expose the self-centering plate permanently mounted on the underside of the telescope housing. This self-centering plate is located approximately on the vertical axis of rotation. A trivet plate with a translation stage assembly (with two slides in orthogonal directions) is set on the self-centering plate. See Figure 10. A theodolite with an EDM instrument was set up on a tripod approximately 20 meters away, and a prism is placed in the tribrach at the top of the translation stage assembly. The center of the prism is sighted and the distance measurement recorded. Then the SLR telescope is rotated 180 degrees about the vertical axis and the distance to the prism target is measured again. The translation stage is adjusted one-half of the value of the difference in the distance measurements. The SLR telescope is rotated 90 degrees from the original position and the process is repeated again. The whole process is repeated until the distance measurement to the prism stays within 0.5 mm throughout a 360 degree rotation of the SLR telescope.

Figure 10. Translation Stage on MOBLAS 7 Telescope

The survey observations are then completed with instruments and targets set up on the translation stage assembly as a typical survey standpoint. The instrument height and target heights are measured relative to the top of the self-centering plate. See Appendix E for more information.

During the second step for MOBLAS 7, the vertical offset from the top of the self-centering plate to the horizontal axis of rotation was determined by running direct differential levels to the top of the self-centering plate and also to the top of the top side of spotting telescope eyepiece located on the horizontal (elevation) rotation axis of the mount. Then the measurements were repeated to the eyepiece with the mount telescope plunged 180 degrees. The diameter of the telescope eyepiece was measured with calipers. All measurements were repeated again as a check. This measured value of this offset is 0.489 m.

4.5.1 SLR Conventional Reference Point Eccentricities

It is necessary to measure the eccentricities from the 7105 station survey mark to the conventional reference point of the SLR telescope. After the horizontal location of the vertical axis of rotation was determined, as previously described, it was transferred to the 7105 station mark by the following method. The method utilizes two theodolites set up on tripods located such that there will be a lines-of-sight (as close to 90 degrees apart as possible) to both the survey target on the top of the SLR telescope (representing the vertical axis of rotation) and the 7105 station survey mark beneath the trailer. The theodolite is sighted on the survey target and then the theodolite telescope is plunged down to 7105 station survey mark. This line-of-sight is graphically marked on the brass disk. The procedure is repeated with the second theodolite. The determined plumb point below the survey target (again representing the vertical axis of rotation) is the graphical intersection of the two theodolite lines-of-sight. The distance from the center point of the 7105 station survey mark to the graphical intersection point is measured with a pocket scale, relative to the North and East directions.

The vertical eccentricity is determined by direct differential levels between the 7105 station survey mark and the top of the self-centering plate mounted on the SLR telescope housing.

4.6 GPS Antenna Observations

The GODE GPS station ground mark, designated "JPL 4006 – 1992" (DOMES number 40451M123), is the center point of a stainless steel plate imbedded in the concrete pier.

The conventional reference point for the JPL Dorne/Margolin choke ring antenna is defined as the center of the 5/8"-11 threaded insert at the base of the power amplifier (BPA). This is also referred to as the Antenna Reference Point (ARP). According to the IGS GODE site log, the ARP is 0.0614 m directly above the station ground mark (i.e. – north and east offsets = 0.000).

In order to precisely survey the ground mark, it was advantageous to remove the GODE radome and GPS antenna for a short period of time to enable access to the survey point. With approval from the IGS station coordinator, the GODE GPS antenna was removed for approximately 4 hours on April 19, 2001 and then replaced. The ground mark survey was repeated when the GODE GPS antenna was removed for approximately 7 hours on September 10, 2003 and then replaced. A tripod was set up over the station mark during this survey work, which was completed with the same methods and procedures as the other ground marks in the survey control network.

For some additional observations the GODE GPS antenna was not removed, so the conventional reference point was determined by indirect methods. However, before starting the observations, arrangements were made with the IGS station coordinator to remove the GPS antenna radome during the survey observation time period to eliminate the chance of a distorted line of sight when observing through the plastic radome. The radome was removed for approximately 7 hours on June 10 and June 11, 2002 and then replaced each day.

For the horizontal position, the forward intersection method was used by observing horizontal directions (4 sets, direct and reverse pointings) to the tangent point of both the left side and right side of the outer-most choke ring element. This was performed from four different ground survey control stations. In the adjustment, the mean of the left and right directions was used as input for the horizontal directions.

The vertical position was determined by running direct differential levels to the top of the choke ring elements at three different points from three different ground survey control stations. In the adjustment, the height difference was reduced to the ARP and the JPL 4006 survey point based on the published dimensions in the site log for the JPL choke ring antenna (0.102 m TCR) and the fixed-height of the center spike in JPL antenna mount fixture (0.0614 m). This difference in height was verified by the results of the direct differential levels.

4.7 DORIS Antenna Observations

The survey observations for the DORIS pillar monument were completed in February 2000, prior to the original installation of the triangular pillar fixture and the DORIS antenna by IGN. A standard survey tribrach was mounted on the self-centering survey plate fixed to the top of the pillar and the typical survey observations, as described elsewhere in this report, were performed to determine the horizontal and vertical position of the GREB pillar survey mark.

The conventional reference point for the DORIS antenna is defined as the projection of the 2 GHz phase center (located at the mid-point of the narrow end of the antenna) on the plane containing the red circle (located at the mid-point of the wide part of the antenna).

In June 2000, IGN installed the triangular pillar fixture on the self-centering survey plate imbedded in the top of the pillar and mounted the DORIS antenna. At this time, the verticality of DORIS antenna was adjusted to plumb the 2GHz phase center directly (+/- 0.5 mm) over the center of the pillar survey plate by turning the nuts fixing the triangular baseplate on the threaded rods of the pillar fixture. Then the height of the red circle on the antenna above the top of the pillar survey plate was measured as 0.518 m by the IGN installation team.

In the adjustment, the horizontal offsets of the GREB reference point are equal to 0.000m relative to the pillar survey mark, while the vertical offset is 0.518 m above the pillar survey mark. This previously determined height was verified by a measurement with a pocket tape.

4.8 GPS Observations for Network Orientation

In order to provide for orientation of the topocentric survey network with the ITRF, GPS data was collected on select survey ground control monuments and pillars. The GPS observations consisted of ten sessions on seven different days, with session durations ranging from 2.0 hours to 6.3 hours, all with a sampling rate of 30 seconds. For each session, GPS observations were collected with the three or four Trimble 4000SSE receivers.

5. Survey Computations

5.1 Survey Control Network

The conventional electro-optical survey data recorded in the field (distances, horizontal directions, zenith distances, and direct differential levels) was reduced and organized in abstract forms for subsequent input into a preliminary least-squares adjustment. The distance measurements were corrected for the deviations in atmospheric pressure and temperature.

The National Geodetic Survey (NGS) software HAVAGO was used for the preliminary least-squares adjustment. The input file was developed from the conventional survey observations. The coordinates for 7105 were constrained and a control azimuth was developed from the GPS observations and analysis. The preliminary adjustment was used to identify any blunders or

outliers in the survey observations, and verify that the accuracy of the survey meets the requirements.

5.2 GPS Network

The Trimble GPS data was post-processed with the Trimble software GPSurvey, version 2.35a with the following parameters: 15° elevation angle cutoff; broadcast satellite ephemeris; L1 final solutions; and NGS antenna phase center variation calibration data.

5.3 VLBI Conventional Reference Point

The survey data recorded in the field for the VLBI antenna observations in 2002 and 2003 was reduced and organized for subsequent input into a least-squares adjustment for each quadrant arc (north and east) for the apex target and the horizontal circles (orange target and green target) for the elevation axis targets. The NGS software HAVAGO was used for the least-squares adjustment of the VLBI antenna observations. The ground survey control stations, occupied during the antenna observations, and the VLBI station 7108 were constrained for the adjustment at the coordinate results from a separate preliminary HAVAGO adjustment of the survey control network. An approximate assumed (preliminary) position for the VLBI conventional reference point was also held constrained.

The HAVAGO input format offers an option to calculate (and provide in the output file) miscellaneous data for selected lines (such as DX, DY, DZ and DN, DE, DU). These output values are then used as input for a circle fit software program that computes the best-fit circle properties (delta coordinates values for the circle center and the radius) for a series of points on a scribed arc or circle. For example on the north quadrant arc, the HAVAGO miscellaneous data DN and DU output values describe the points on a circle with the center on the horizontal (elevation) axis of rotation. These DN and DU values are formatted as input to circle fit software, which then calculates the change in coordinates (from the preliminary value to the final value) and the computed radius of the circle. This procedure is then repeated for the other quadrant. For the 2002 survey, the procedure repeated again for the horizontal circles about the vertical axis of rotation. Any points on the computed circle with a standard error of greater than 1 mm are rejected, and the circle fit computations are repeated. The computed mean delta values (DN, DE, DU or DX, DY, DZ) between preliminary VLBI conventional reference point and the final VLBI conventional reference point will then be used as input for the final adjustment.

As an example of the accuracy of the method, a summary of the computed radii of the circle encompassing the survey apex target points on each of the independently scribed arcs is shown in Table 1. In both 2002 and 2003, the computed radii values agree to 0.0001 m. The apex target was removed and the antenna disassembled and re-assembled between the 2002 and 2003 surveys. The full HAVAGO adjustments and circle fit outputs are shown in Appendix F.

Table 1. Computed Radii of the Circle Encompassing the Apex Target Points

Quadrant	Circle Radius
North (2002)	3.8541 m
East (2002)	3.8542 m
North (2003)	3.8535 m
East (2003)	3.8534 m

6. Results

The final comprehensive least-squares adjustment of survey is completed with the GeoLab3 v3.72 software, and is a combination of the survey control network observations and the GPS observations. The conventional survey observations for the survey control network are used to develop the input file, along with geodetic azimuths from the GPSurvey GPS post-processing of selected GPS baselines. The coordinates for the 7105 station were constrained at 1 mm to the ITRF2000, epoch 1997.0 values.

6.1 Summary Results of Final Adjustment

The summary of the adjusted coordinates from GeoLab are shown below in Table 2. The full results are provided in Appendix G.

Table 2 is a translation table provided to help coordinate the survey point description and the name used in the adjustment for selected points of interest.

Table 2. Translation Table for Survey Point Names

Survey Point Description/Name	DOMES Number	Adjustment Name
VLBI station survey mark/7108	40451M125	7108(93)
SLR station survey mark/7105	40451M105	7105
DORIS antenna reference point/GREB	40451S176	DORIS GREB
DORIS pillar survey mark		DORIS PIER
GPS GODE station survey mark/JPL 4006	40451M123	4006E
SLR MOBLAS 7 conventional reference point (2003)		MOB7(03)
VLBI MV3 conventional reference point (2002) mobile configuration (surveyed)		MV3(02)
VLBI MV3 preliminary reference point (2002) mobile configuration (assumed)		MV3(02PRE)
VLBI MV3 conventional reference point (2003) fixed configuration (surveyed)		MV3(03)
VLBI MV3 preliminary reference point (2003) fixed configuration (assumed)		MV3(03PRE)

Adjusted PLH Coordinates:

CODE	FFF	STATION		LATITUDE STD DEV		LONGITUDE STD DEV	ELIP-HEIGHT STD DEV
PLH	000	4005W	N 39 1	18.02098 0.0005	W 76 49	37.51232 0.0007	14.2397 m 0.0004
PLH	000	4006E	N 39 1	18.21819 0.0005	W 76 49	36.58370 0.0007	14.5087 m 0.0004
PLH	111	7105	N 39 1	14.17743 0.0000	W 76 49	39.69784 0.0000	19.1940 m 0.0000
PLH	000	7108(93)	N 39 1	18.93304 0.0006	W 76 49	35.55077 0.0008	13.7448 m 0.0005
PLH	000	7108RM1	N 39 1	18.36753 0.0007	W 76 49	34.47587 0.0007	13.3557 m 0.0004
PLH	000	7918ECC	N 39 1	14.58437 0.0006	W 76 49	40.27827 0.0006	18.7054 m 0.0007
PLH	000	CAL(A)01	N 39 1	15.63989 0.0006	W 76 49	35.68958 0.0006	16.4287 m 0.0003
PLH	000	CAL(B)01	N 39 1	14.35267 0.0010	W 76 49	30.55668 0.0006	16.1551 m 0.0004
PLH	000	CAL(B)02	N 39 1	13.63260 0.0008	W 76 49	32.46975 0.0006	16.9665 m 0.0004
PLH	000	CAL(C)01	N 39 1	12.74558 0.0008	W 76 49	32.85656 0.0006	17.3135 m 0.0004
PLH	000	CAL(D)98	N 39 1	12.14112 0.0005	W 76 49	40.64590 0.0006	19.8853 m 0.0004
PLH	000	DORIS GREB	N 39 1	12.25146 0.0008	W 76 49	40.42722 0.0008	20.4339 m 0.0007
PLH	000	DORIS PIER	N 39 1	12.25146 0.0006	W 76 49	40.42722 0.0007	19.9159 m 0.0005
PLH	000	GODDARD	N 39 1	14.77710 0.0005	W 76 49	40.58620 0.0006	18.0316 m 0.0005
PLH	000	GODDARD2	N 39 1	15.81023 0.0005	W 76 49	39.87002 0.0006	17.2803 m 0.0005
PLH	000	GORF89	N 39 1	12.78694 0.0005	W 76 49	39.68449 0.0006	18.3498 m 0.0004
PLH	000	MOB7(01)	N 39 1	14.17715 0.0005	W 76 49	39.69919 0.0006	22.3324 m 0.0007
PLH	000	MOB7(03)	N 39 1	14.17721 0.0005	W 76 49	39.69920 0.0006	22.3329 m 0.0004
PLH	000	MV3(02)	N 39 1	18.93418 0.0014	W 76 49	35.55016 0.0014	18.0712 m 0.0014
PLH	111	MV3(02PRE)	N 39 1	18.93314	W 76 49	35.55082	18.0970 m

					0.0000			0.0000		0.0000	
PLH	000	MV3(03)	N	39	1	18.93321	W	76	49	35.55076	16.8140 m
					0.0019			0.0019		0.0019	
PLH	111	MV3(03PRE)	N	39	1	18.93311	W	76	49	35.55097	17.0410 m
					0.0000			0.0000		0.0000	
PLH	000	NGEOS	N	39	1	15.43371	W	76	49	38.95938	18.9672 m
					0.0004			0.0006		0.0002	
PLH	000	PIER(A)95	N	39	1	19.91830	W	76	49	35.36083	13.7636 m
					0.0006			0.0008		0.0004	
PLH	000	PIER(B)95	N	39	1	16.36195	W	76	49	38.36406	17.7529 m
					0.0005			0.0006		0.0004	
PLH	000	PIER(C)95	N	39	1	19.44860	W	76	49	37.49767	12.6559 m
					0.0005			0.0008		0.0004	
PLH	000	SGEOS	N	39	1	12.63678	W	76	49	38.94125	18.8667 m
					0.0005			0.0006		0.0003	
PLH	000	SLR00(03)	N	39	1	12.96614	W	76	49	38.92632	22.1999 m
					0.0006			0.0007		0.0006	
PLH	000	TLRS4(03)	N	39	1	15.27142	W	76	49	38.82207	21.2789 m
					0.0006			0.0006		0.0007	

Adjusted XYZ Coordinates:

CODE	FFF	STATION	X-COORDINATE STD DEV	Y-COORDINATE STD DEV	Z-COORDINATE STD DEV	
XYZ		4005W	1130752.9400	-4831262.1868	3994195.5046	m
			0.0007	0.0004	0.0005	
XYZ		4006E	1130773.8656	-4831253.5710	3994200.3990	m
			0.0007	0.0004	0.0005	
XYZ		7105	1130719.6320	-4831350.5771	3994106.5389	m
			0.0000	0.0000	0.0000	
XYZ		7108(93)	1130794.7612	-4831233.8163	3994217.0443	m
			0.0008	0.0005	0.0006	
XYZ		7108RM1	1130822.3713	-4831238.3199	3994203.2509	m
			0.0008	0.0005	0.0006	
XYZ		7918ECC	1130704.1497	-4831345.6963	3994115.9809	m
			0.0006	0.0007	0.0007	
XYZ		CAL(A)01	1130806.5567	-4831298.8643	3994139.8361	m
			0.0006	0.0004	0.0005	
XYZ		CAL(B)01	1130932.4311	-4831294.8500	3994108.8240	m
			0.0006	0.0007	0.0008	
XYZ		CAL(B)02	1130890.9518	-4831319.5653	3994092.0831	m
			0.0006	0.0006	0.0007	
XYZ		CAL(C)01	1130885.8780	-4831338.7171	3994071.0499	m
			0.0006	0.0006	0.0006	
XYZ		CAL(D)98	1130706.5572	-4831394.7927	3994058.1869	m
			0.0006	0.0004	0.0005	
XYZ		DORIS GREB	1130711.2883	-4831391.9231	3994061.1759	m
			0.0008	0.0007	0.0007	
XYZ		DORIS PIER	1130711.1966	-4831391.5312	3994060.8498	m
			0.0007	0.0005	0.0006	
XYZ		GODDARD	1130695.9650	-4831343.2311	3994120.1741	m
			0.0006	0.0005	0.0005	
XYZ		GODDARD2	1130708.0361	-4831319.2056	3994144.4535	m
			0.0006	0.0005	0.0005	
XYZ		GORF89	1130725.9473	-4831376.1519	3994072.6932	m
			0.0006	0.0004	0.0004	
XYZ		MOB7(01)	1130720.1573	-4831352.9638	3994108.5082	m

		0.0006	0.0006	0.0006	
XYZ	MOB7(03)	1130720.1568	-4831352.9632	3994108.5099	m
		0.0006	0.0004	0.0005	
XYZ	MV3(02)	1130795.5363	-4831237.0641	3994219.7956	m
		0.0014	0.0014	0.0014	
XYZ	MV3(02PRE)	1130795.5301	-4831237.1069	3994219.7869	m
		0.0000	0.0000	0.0000	
XYZ	MV3(03)	1130795.3040	-4831236.1348	3994218.9808	m
		0.0019	0.0019	0.0019	
XYZ	MV3(03PRE)	1130795.3397	-4831236.3095	3994219.1214	m
		0.0000	0.0000	0.0000	
XYZ	NGEOS	1130731.3304	-4831322.6077	3994136.4947	m
		0.0006	0.0003	0.0004	
XYZ	PIER(A)95	1130794.8536	-4831214.1626	3994240.6612	m
		0.0009	0.0004	0.0005	
XYZ	PIER(B)95	1130740.9524	-4831300.8775	3994157.9692	m
		0.0006	0.0004	0.0004	
XYZ	PIER(C)95	1130746.6858	-4831233.9190	3994228.7105	m
		0.0008	0.0004	0.0005	
XYZ	SGEOS	1130744.1121	-4831375.3072	3994069.4211	m
		0.0006	0.0004	0.0004	
XYZ	SLR00(03)	1130743.5949	-4831371.5206	3994079.4105	m
		0.0007	0.0006	0.0006	
XYZ	TLRS4(03)	1130735.6739	-4831326.6718	3994134.0620	m
		0.0006	0.0006	0.0007	

2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):

STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
4005W	0.0018	113	0.0011	0.0008
4006E	0.0019	118	0.0011	0.0008
7108(93)	0.0022	122	0.0012	0.0011
7108RM1	0.0021	130	0.0012	0.0008
7918ECC	0.0015	106	0.0014	0.0014
CAL(A)01	0.0016	135	0.0012	0.0007
CAL(B)01	0.0025	177	0.0014	0.0008
CAL(B)02	0.0020	1	0.0014	0.0008
CAL(C)01	0.0019	16	0.0014	0.0007
CAL(D)98	0.0016	113	0.0012	0.0008
DORIS GREB	0.0021	122	0.0018	0.0013
DORIS PIER	0.0017	122	0.0013	0.0009
GODDARD	0.0015	118	0.0012	0.0010
GODDARD2	0.0015	95	0.0012	0.0010
GORF89	0.0014	104	0.0011	0.0008
MOB7(01)	0.0014	117	0.0012	0.0013
MOB7(03)	0.0014	115	0.0012	0.0008
MV3(02)	0.0034	0	0.0034	0.0027
MV3(03)	0.0048	0	0.0048	0.0038
NGEOS	0.0014	111	0.0010	0.0005
PIER(A)95	0.0022	118	0.0011	0.0008
PIER(B)95	0.0015	112	0.0011	0.0007
PIER(C)95	0.0020	108	0.0011	0.0008
SGEOS	0.0014	97	0.0011	0.0007
SLR00(03)	0.0017	95	0.0015	0.0011
TLRS4(03)	0.0016	121	0.0013	0.0014

6.2 VLBI Conventional Reference Point Eccentricity and Axis Offset

Table 3 and Table 4 show values for the eccentricity of the VLBI conventional reference point (intersection of mechanical axes) from the VLBI station survey mark (7108). These values were computed from the observations taken during the surveys in 2002 and 2003 and the results of the adjustment.

While it was assumed that the horizontal axis of rotation intersects with the vertical axis of rotation (i.e. – offset distance is 0.000 m), the analysis of the survey results indicate the actual horizontal axis offset is more accurately equal to +0.0005 m.

Table 3. Values of Eccentricity of VLBI Conventional Reference Point in Mobile Configuration (2002) from 7108

DN (m) Sigma	DE (m) Sigma	DU (m) Sigma
+0.0348 0.0018	+0.0149 0.0019	+4.3264 0.0018
DX (m) Sigma	**DY (m) Sigma**	**DZ (m) Sigma**
+0.7755 0.0019	-3.2480 0.0018	+2.7511 0.0018

Table 4. Values of Eccentricity of VLBI Conventional Reference Point in Fixed Configuration (2003) from 7108

DN (m) Sigma	DE (m) Sigma	DU (m) Sigma
+0.0049 0.0018	+0.0005 0.0019	+3.0692 0.0018
DX (m) Sigma	**DY (m) Sigma**	**DZ (m) Sigma**
+0.5432 0.0019	-2.3186 0.0018	+1.9363 0.0018

For comparison, Table 5 show values for the eccentricity of the VLBI conventional reference point from the VLBI station survey mark (7108) from the subsequent survey 2007. A report on the 2007 survey has been issued previously.

Table 5. 2007 Values for the Eccentricity of the VLBI Conventional Reference Point in Fixed Configuration

DN (m) Sigma	DE (m) Sigma	DU (m) Sigma
+0.0060 0.0006	+0.0020 0.0006	+3.0690 0.0012
DX (m) Sigma	**DY (m) Sigma**	**DZ (m) Sigma**
+0.5440 0.0006	-2.3170 0.0010	+1.9370 0.0009

Table 6 shows the comparison of the values for the eccentricity of the VLBI conventional reference point between the co-location surveys in 2007 and 2003.

Table 6. Comparison of VLBI Eccentricities Between 2007 and 2003 Surveys

	DX	DY	DZ
2007 Survey	+0.5440	-2.3170	+1.9370
2003 Survey	+0.5432	-2.3186	+1.9363
Difference (X,Y,Z)	**+0.0008**	**+0.0016**	**+0.0007**
Difference (N,E,h)	*+0.0011*	*+0.0015*	*-0.0002*

6.3 SLR Conventional Reference Point Eccentricity

Table 7 shows values for the eccentricity of the SLR conventional reference point (intersection of mechanical axes) from the SLR station survey mark (7105). These values were computed from the observations taken during this survey and the results of the adjustment.

Table 7. 2003 Values for Eccentricity of SLR Conventional Reference Point from 7105

DN (m) Sigma	DE (m) Sigma	DU (m) Sigma
-0.0068 0.0005	-0.0327 0.0005	+3.1389 0.0005
DX (m) Sigma	**DY (m) sigma**	**DZ (m) sigma**
+0.5248 0.0005	-2.3861 0.0005	+1.9710 0.0005

For comparison Table 8 shows values for the eccentricity of the SLR conventional reference point from the SLR station survey mark (7105) from the subsequent 2007 survey. A report on the 2007 survey has been issued previously.

Table 8. 2007 Values for Eccentricity of SLR Conventional Reference Point from 7105

DN (m) Sigma	DE (m) Sigma	DU (m) Sigma
-0.0070 0.0003	-0.0340 0.0003	+3.1380 0.0004
DX (m) Sigma	**DY (m) sigma**	**DZ (m) sigma**
+0.5240 0.0003	-2.3850 0.0003	+1.9700 0.0004

Table 9 shows the comparison of the values for the eccentricity of the SLR conventional reference point between the co-location surveys in 2007 and 2003.

Table 9. Comparison of SLR Eccentricities Between 2007 and 2003 Surveys

	DX	DY	DZ
2007 Survey	+0.5240	-2.3850	+1.9700
2003 Survey	+0.5248	-2.3861	+1.9710
Difference (X,Y,Z)	**-0.0008**	**+0.0011**	**-0.0010**
Difference (N,E,h)	*-0.0002*	*-0.0013*	*-0.0009*

6.4 Co-location Vector Components

The local tie vectors were computed from the results of the final GeoLab least-squares adjustment.

Table 10 contains a summary of the local tie vectors, as determined during this survey.

Table 10. Local Tie Vectors Computed from 2003 Survey Results

From DOMES	To DOMES	DX Sigma	DY Sigma	DZ Sigma	Code/CDP	Code/CDP
40451M123	40451M105	-54.2336 0.0008	-97.0060 0.0004	-93.8599 0.0005	GODE	7105
40451M123	40451M125	20.8955 0.0004	19.7549 0.0004	16.6455 0.0004	GODE	7108
40451M123	40451S176	-62.5773 0.0012	-138.3519 0.0012	-139.2229 0.0012	GODE	GREB

Table 11 contains a summary of the local tie vectors as determined during the subsequent co-location survey conducted at GGAO in 2007. A report on the 2007 survey has been issued previously.

Table 11. Local Tie Vectors Computed from 2007 Survey Results

From DOMES	To DOMES	DX Sigma	DY Sigma	DZ Sigma	Code/CDP	Code/CDP
40451M123	40451M105	-54.2315 0.0004	-97.0089 0.0004	-93.8628 0.0004	GODE	7105
40451M123	40451M125	20.8938 0.0003	19.7538 0.0003	16.6445 0.0003	GODE	7108
40451M123	40451S176	-62.5753 0.0008	-138.3553 0.0008	-139.2262 0.0008	GODE	GREB

For comparison, Table 12 shows the local tie vectors used in the combination solution of ITRF2005.

Table 12. Local Tie Vectors Used in Combination of ITRF2005

From DOMES	To DOMES	DX Sigma	DY Sigma	DZ Sigma	Code/CDP	Code/CDP
40451M123	40451M105	-54.2300 0.0003	-97.0090 0.0030	-93.8630 0.0030	GODE	7105
40451M123	40451M125	20.8950 0.0500	19.7530 0.0500	16.6470 0.0500	GODE	7108
40451M123	40451S176	-62.5730 0.0030	-138.3550 0.0030	-139.2260 0.0030	GODE	GREB

Table 13 is a summary of the comparison between the local tie vectors determined in 2003 survey and the subsequent co-location survey performed in 2007.

Table 13. Comparison of Local Tie Vectors Between 2007 and 2003 Surveys

	DX	DY	DZ	Code/CDP	Code/CDP
2007 Survey	-54.2315	-97.0089	-93.8628	GODE	7105
2003 Survey	-54.2336	-97.0060	-93.8599	GODE	7105
Difference (X,Y,Z)	**+0.0021**	**-0.0029**	**-0.0029**		
Difference (N,E,h)	*-0.0044*	*+0.0014*	*+0.0007*		
2007 Survey	20.8938	19.7538	16.6445	GODE	7108
2003 Survey	20.8955	19.7549	16.6455	GODE	7108
Difference (X,Y,Z)	**-0.0017**	**-0.0011**	**-0.0010**		
Difference (N,E,h)	*-0.0013*	*-0.0020*	*-0.0001*		
2007 Survey	-62.5753	-138.3553	-139.2262	GODE	GREB
2003 Survey	-62.5773	-138.3519	-139.2229	GODE	GREB
Difference (X,Y,Z)	**+0.0020**	**-0.0034**	**-0.0033**		
Difference (N,E,h)	*-0.0050*	*+0.0012*	*+0.0008*		

Appendix A. GPS GODE IGS Site Log

```
     International GPS Service
     GODE Site Information Form
     See Instructions at:
       ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.   Form

     Prepared by (full name)  : Oivind Ruud
     Date Prepared            : 2008-02-07
     Report Type              : UPDATE
     If Update:
      Previous Site Log       : gode_20060420.log
      Modified/Added Sections : 6.6-9, 11

1.  Site Identification of the GNSS Monument

     Site Name                : GGAO (Greenbelt)
     Four Character ID        : GODE
     Monument Inscription     : JPL 4006
     IERS DOMES Number        : 40451M123
     CDP Number               : (none)
     Monument Description     : PILLAR
       Height of the Monument : 0.5
       Monument Foundation    : CONCRETE PIER
       Foundation Depth       : (m)
     Marker Description       : DIVOT on stainless steel plate
     Date Installed           : 1993-04-02
     Geologic Characteristic  : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
       Bedrock Type           : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
       Bedrock Condition      : (FRESH/JOINTED/WEATHERED)
       Fracture Spacing       : (1-10 cm/10-50 cm/50-200 cm/over 200 cm)
       Fault zones nearby     : (YES/NO/Name of the zone)
         Distance/activity    : (multiple lines)
     Additional Information   : (multiple lines)
                              : See Question #5
                              : There appears to be an error in Question #5,
                              : Table "GORF 1993 HAVAGO ADJUSTMENT", the first
                              : line indicates that CDP 7102 corresponds to
                              : IERS-40451-DOMES#  M123. According to "IERS
                              : Technical Note 20, Results and Analysis of the
                              : ITRF94" March 1996, Table T2 "Directory of IERS
                              : Stations" pT21, CDP 7102 corresponds to
                              : 40451M102. GODE, 40451M123, does not have a CDP
                              : number.

2.   Site Location Information

     City or Town             : Greenbelt
     State or Province        : Maryland
     Country                  : USA
     Tectonic Plate           : NOAM
     Approximate Position (ITRF)
       X coordinate (m)       : 1130773.7180
       Y coordinate (m)       : -4831253.5810
       Z coordinate (m)       : 3994200.4220
       Latitude (N is +)      : +390118.2193
       Longitude (E is +)     : -0764936.5898
```

```
       Elevation (m,ellips.)  : 14.5046
     Additional Information   :


3.  GNSS Receiver Information


3.1  Receiver Type            : ROGUE SNR-8000
     Satellite System         : GPS
     Serial Number            : 129
     Firmware Version         : 93.06.08
     Elevation Cutoff Setting : 4
     Date Installed           : 1993-04-17T00:00Z
     Date Removed             : 1994-12-12T00:00Z
     Temperature Stabiliz.    : none
     Additional Information   : (multiple lines)

3.2  Receiver Type            : ROGUE SNR-8000
     Satellite System         : GPS
     Serial Number            : R148
     Firmware Version         : 3.2
     Elevation Cutoff Setting : 4
     Date Installed           : 1994-12-12T00:00Z
     Date Removed             : 1999-05-18T14:45Z
     Temperature Stabiliz.    : none
     Additional Information   : (multiple lines)

3.3  Receiver Type            : AOA SNR-12 ACT
     Satellite System         : GPS
     Serial Number            : R253-U
     Firmware Version         : 3.3.32.2
     Elevation Cutoff Setting : 4
     Date Installed           : 1999-05-18T14:45Z
     Date Removed             : 2002-04-16T18:00Z
     Temperature Stabiliz.    : none
     Additional Information   : operated at 1s samprate
                              : converted to 30s data at JPL
                              : using do_npt with lfit_2 option

3.4  Receiver Type            : AOA SNR-12 ACT
     Satellite System         : GPS
     Serial Number            : R253-U
     Firmware Version         : 3.3.32.5
     Elevation Cutoff Setting : 4
     Date Installed           : 2002-04-16T18:00Z
     Date Removed             : 2002-05-03T19:00Z
     Temperature Stabiliz.    : none
     Additional Information   : firmware update,
                              : now run at 30s samprate

3.5  Receiver Type            : AOA SNR-8000 ACT
     Satellite System         : GPS
     Serial Number            : T341-U
     Firmware Version         : 3.3.32.5
     Elevation Cutoff Setting : 4
     Date Installed           : 2002-05-03T19:10Z
     Date Removed             : 2006-04-10T13:10Z
     Temperature Stabiliz.    : none
     Additional Information   : failed receiver replacement

3.6  Receiver Type            : ASHTECH UZ-12
     Satellite System         : GPS
     Serial Number            : ZR520013801
```

```
     Firmware Version         : CQ00
     Elevation Cutoff Setting : 4
     Date Installed           : 2006-04-11T00:00Z
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : none
     Additional Information   :

3.x  Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
     Satellite System         : (GPS/GLONASS/GPS+GLONASS)
     Serial Number            : (A5)
     Firmware Version         : (A11)
     Elevation Cutoff Setting : (deg)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Temperature Stabiliz.    : (none or tolerance in degrees C)
     Additional Information   : (multiple lines)

4.  GNSS Antenna Information


4.1  Antenna Type             : AOAD/M_T        JPLA
     Serial Number            : 129
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  : 0.0614
     Marker->ARP North Ecc(m) : 0.0000
     Marker->ARP East Ecc(m)  : 0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : JPLA
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : 1993-04-17T00:00Z
     Date Removed             : 2001-06-01T17:00Z
     Additional Information   : (multiple lines)

4.2  Antenna Type             : AOAD/M_T        JPLA
     Serial Number            : 129
     Antenna Reference Point  : BPA
     Marker->ARP Up Ecc. (m)  : 0.0614
     Marker->ARP North Ecc(m) : 0.0000
     Marker->ARP East Ecc(m)  : 0.0000
     Alignment from True N    : 0
     Antenna Radome Type      : JPLA
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : 2001-06-01T19:00Z
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : antenna electronics modified internally;
                              : LNA replaced with lower NF unit,
                              : bandpass element relocated from between
                              : antenna element and LNA, to after LNA.
                              :
                              : Note radome changes (on/off) in 2002 -
                              : (local survey/testing)
                              : DAY  Dome Removed   Dome Replaced
                              : 135  13:30 UTC      21:30 UTC
                              : 136  15:30 UTC      20:30 UTC
                              : 141  14:00 UTC      19:00 UTC
                              : 144  13:30 UTC      21:00 UTC
                              : 148  13:30 UTC      21:00 UTC
                              : 150  14:00 UTC      21:00 UTC
                              : 151  13:30 UTC      21:00 UTC
```

```
4.x  Antenna Type             : (A20, from rcvr_ant.tab; see instructions)
     Serial Number            : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)

5.  Surveyed Local Ties


5.1  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   :
     Tied Marker DOMES Number :
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 :
       dy (m)                 :
       dz (m)                 :
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : see IGSMAIL #233

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 :
       dy (m)                 :
       dz (m)                 :
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)

6.   Frequency Standard


6.1  Standard Type            : H-MASER
       Input Frequency        : 5 MHz
       Effective Dates        : 1993-08-01/1999-11-03T17:00Z
       Notes                  : clock steering disabled

6.2  Standard Type            : INTERNAL
       Input Frequency        : 5 MHz
       Effective Dates        : 1999-11-03T17:00Z/1999-11-05T17:30Z
       Notes                  : clock steering enabled

6.3  Standard Type            : H-MASER
       Input Frequency        : 5 MHz
       Effective Dates        : 1999-11-05T17:30Z/2002-06-03
       Notes                  : clock steering disabled
```

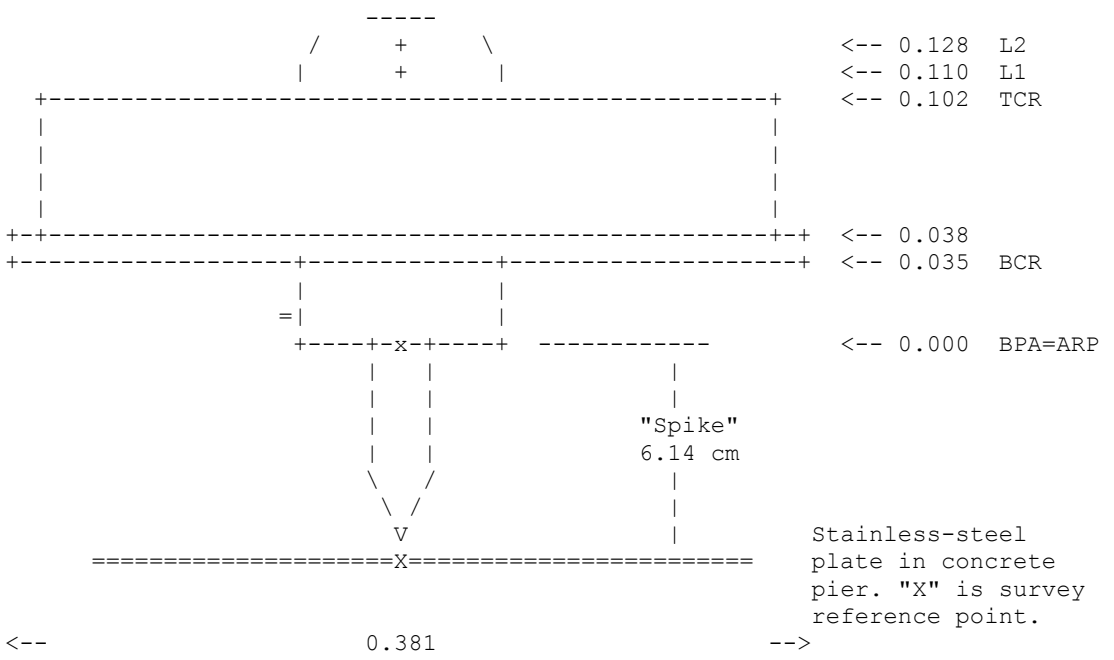
```
6.4  Standard Type            : INTERNAL
       Input Frequency        : 5 MHz
       Effective Dates        : 2002-06-03/2002-06-25T16:27Z
       Notes                  : clock steering enabled

6.5  Standard Type            : H-MASER
       Input Frequency        : 5 MHz
       Effective Dates        : 2002-06-25T16:27Z/2008-02-04T14:07Z
       Notes                  : clock steering disabled

6.6  Standard Type            : H-MASER
       Input Frequency        : 5 MHz
       Effective Dates        : 2008-02-04T14:07Z/2008-02-04T14:08Z
       Notes                  : clock steering disabled
                              : during this minute the H-Maser lost
                              : phase lock, and the LO was drifting

6.7  Standard Type            : H-MASER
       Input Frequency        : 5 MHz
       Effective Dates        : 2008-02-04T14:08Z/2008-02-06T16:30Z
       Notes                  : clock steering disabled
                              : normal H-Maser operations

6.8  Standard Type            : H-MASER
       Input Frequency        : 5 MHz
       Effective Dates        : 2008-02-06T16:30Z/2008-02-06T22:15Z
       Notes                  : clock steering disabled
                              : during this maintenance period the
                              : H-Maser lost phase lock, and the
                              : LO was drifting

6.9  Standard Type            : H-MASER
       Input Frequency        : 5 MHz
       Effective Dates        : 2008-02-06T22:15Z/CCYY-MM-DD
       Notes                  : clock steering disabled
                              : normal H-Maser operations

6.x  Standard Type            : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
       Input Frequency        : (if external)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

7.   Collocation Information


7.1  Instrumentation Type     : SLR/VLBI
       Status                 : PERMANENT
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
       Status                 : (PERMANENT/MOBILE)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.   Meteorological Instrumentation


8.1.1  Humidity Sensor Model  :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval :
       Accuracy (% rel h)     : (% rel h)
```

```
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : CCYY-MM-DD/CCYY-MM-DD
       Notes                  : (multiple lines)

8.1.x  Humidity Sensor Model  :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy (% rel h)     : (% rel h)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.2.1  Pressure Sensor Model  :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval :
       Accuracy               : (mbar)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : CCYY-MM-DD/CCYY-MM-DD
       Notes                  : (multiple lines)

8.2.x  Pressure Sensor Model  :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.3.1  Temp. Sensor Model     :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval :
       Accuracy               : (deg C)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : CCYY-MM-DD/CCYY-MM-DD
       Notes                  : (multiple lines)

8.3.x  Temp. Sensor Model     :
       Manufacturer           :
       Serial Number          :
       Data Sampling Interval : (sec)
       Accuracy               : (hPa)
       Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.4.1  Water Vapor Radiometer :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
```

```
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : CCYY-MM-DD/CCYY-MM-DD
       Notes                  : (multiple lines)

8.4.x  Water Vapor Radiometer :
       Manufacturer           :
       Serial Number          :
       Distance to Antenna    : (m)
       Height Diff to Ant     : (m)
       Calibration date       : (CCYY-MM-DD)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Notes                  : (multiple lines)

8.5.1  Other Instrumentation  : (multiple lines)

8.5.x  Other Instrumentation  :

9.  Local Ongoing Conditions Possibly Affecting Computed Position


9.1.x  Radio Interferences    : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degredations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.2.x  Multipath Sources      : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

9.3.x  Signal Obstructions    : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information : (multiple lines)

10.   Local Episodic Effects Possibly Affecting Data Quality


10.1 Date                     : 2002-05-15/2002-05-31
     Event                    : see section 4.2 of sitelog for detail

10.2 Date                     : 2003-09-10/2003-09-10
     Event                    : Antenna removed/replaced for survey
                              : (14:02-20:35UTC)

10.x Date                     : (CCYY-MM-DD/CCYY-MM-DD)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

11.   On-Site, Point of Contact Agency Information

     Agency                   : NASA Goddard Space Flight Center
     Preferred Abbreviation   : GSFC
     Mailing Address          : Space Geodesy Branch, Code 926.9
                              : NASA/GSFC
                              : Greenbelt, MD 20771 USA
     Primary Contact
       Contact Name           : Irv Diegel
       Telephone (primary)    : 301-805-3959
       Telephone (secondary)  :
       Fax                    : 301-805-3974
       E-mail                 : Irv.Diegel@Honeywell.com
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
```

```
       Telephone (secondary)  :
       Fax                    :
       E-mail                 :
     Additional Information   : (multiple lines)

12.  Responsible Agency (if different from 11.)

     Agency                   : Jet Propulsion Laboratory
     Preferred Abbreviation   : JPL
     Mailing Address          : 4800 Oak Grove Drive
                              : Pasadena, CA 91109 USA
     Primary Contact
       Contact Name           : David A. Stowers
       Telephone (primary)    : 818-354-7055
       Telephone (secondary)  :
       Fax                    : 818-393-4965
       E-mail                 : dstowers@jpl.nasa.gov
     Secondary Contact
       Contact Name           : Network Engineer/UNAVCO
       Telephone (primary)    : 303-381-7500
       Telephone (secondary)  :
       Fax                    : 303-381-7451
       E-mail                 : ruud@unavco.org, andreatta@unavco.org
     Additional Information   : Oivind Ruud (303.381.7476) or Victoria
                              : Andreatta (303.381.7458)
13.  More Information

       Primary Data Center    : JPL (ODC-Operational Data Center)
       Secondary Data Center  : CDDIS (GDC-Global Data Center)

     URL for More Information :
       Hardcopy on File
       Site Map               : (Y or URL)
       Site Diagram           : (Y or URL)
       Horizon Mask           : (Y or URL)
       Monument Description   : (Y or URL)
       Site Pictures          : (Y or URL)
     Additional Information   : (multiple lines)
     Antenna Graphics with Dimensions
```

TURBOROGUE: AOA/M_T



ARP: Antenna Reference Point
L1 : L1 Phase Center
TCR: Top of Chokering
BPA: Bottom of Preamplifier
L2 : L2 Phase Center
BCR: Bottom of Chokering

Appendix B. SLR MOBLAS 7 ILRS Site Log

```
ILRS Site and System Information Form
       International Laser Ranging Service

  0.   Form

       Prepared by (Full Name)    : Van S. Husson, Paul Stevens
       Preparer E-mail            : van.husson@honeywell-tsi.com
                                    paul.stevens@honeywell-tsi.com
       Date Prepared              : 2002-07-09
       Report Type                : UPDATE
       Format Version             : 1.0


  1.   Identification of the Ranging System Reference Point (SRP)

       Site Name                  : Goddard Geophysical Astronomical Observatory
       IERS DOMES Number          : 40451M105
       CDP Pad ID                 : 7105
       Subnetwork                 : NASA
       Description                : MONUMENT
       Monument Description       : STANDARD NASA DISK
       Monument Inscription       : 7105-1981
       Mark Description           : Chiselled Cross
       Date Installed             : 1981-03-01
       Date Removed               : (yyyy-mm-dd)
       Geologic Characteristic    : CRETACEOUS SAND AND GRAVEL
       Additional Information     : (multiple lines)


  2.   Site Location Information

       City or Town               : Greenbelt
       State or Province          : Maryland
       Country                    : USA
       Tectonic Plate             : North American
       Approximate Position
         X coordinate          [m]:  1130719.703
         Y coordinate          [m]: -4831350.572
         Z coordinate          [m]:  3994106.526
         Latitude            [deg]: 39.0056 N
         Longitude           [deg]: 76.6610 W
         Elevation             [m]: 19.195
       Additional Information     : (multiple lines)


  3.   General System Information

  3.01 System Name                : MOBLAS 7
       4-Character Code           : GODL
       CDP System Number          : 07
       CDP Occupation Number      : 25
       Eccentricity to SRP (if Not Identical With SRP)
         North                 [m]: -0.008 +- 0.002
         East                  [m]: -0.032 +- 0.002
```

```
       Up                    [m]:  3.139 +- 0.002
       Date Measured             : 1998-12-12
     Date Installed              : 1981-03-01
     Date Removed                : (yyyy-mm-dd)
     Additional Information      : (multiple lines)
```

4. Telescope Information

```
4.01 Receiving Telescope Type    : CASSEGRAIN
       Aperture              [m]: 0.762
       Mount                   : AZ-EL
     Xmitting Telescope Type     : REFRACTOR
       Aperture              [m]: 0.163
     Tracking Camera Type        : CCD
       Model                   : GEN II INTENSIFIER
       Manufacturer            : HTSI
       Field of View       [deg]:
       Minimum Magnitude   [mag]:
     Transmit/Receive Path       : SEPARATE
     Transmit/Receive Switch     : NONE
     Max Slew Rate Az    [deg/s]: 20
     Max Slew Rate El    [deg/s]: 5
     Max Used Tracking Rate Az   : 5
     Max Used Tracking Rate El   : 3
     Telescope Shelter           : ROLL-BACK ROOF
     Daylight Filter Type        : Omega Optical 532NB1 9114
     Dayl. Filt. Bandwidth  [nm]: 100
     Adjustable Attenuation      : RECEIVE
     Transmit Efficiency         : 0.94
     Receive Efficiency          : 0.76
     Date Installed              : 1981-03-01
     Date Removed                : (yyyy-mm-dd)
     Additional Information      : CCD built from Coho CCD head and
                                   Litton image intensifier, receive
                                   efficiency is .76 without daylight
                                   filter and .54 with daylight filter
```

5. Laser System Information

```
5.01 Laser Type                  : ND:YAG
     Number of Amplifiers        : 1
     Primary Wavelength     [nm]: 1064
     Primary Maximum Energy [mJ]: 200
     Secondary Wavelength   [nm]: 532
     Secondary Max. Energy  [mJ]: 100
     Xmit Energy Adjustable      : YES
     Pulse Width (FWHM)     [ps]: 200
     Max. Repetition Rate   [Hz]: 5
     Fullw. Beam Divergence  ["]: 30
     Final Beam Diameter    [m]: 0.093
     Eyesafe                     : NO
     Eyesafe Standard            : ANSI 136.1
     Date Installed              : 1981-03-01
     Date Removed                : (yyyy-mm-dd)
     Additional Information      : 1) Laser repetition rate is 10 Hz,
                                   but the time interval counter
                                   restricts the maximum rate to 5 Hz.
                                   2) Laser Cavity Upgrade 2001-09-07.
```

```
6.   Receiver System

6.01.01 Primary Chain
        Wavelength          [nm]: 532
        Detector Type           : MCP
          Manufacturer          : ITT
          Model                 : F4129F
          Quantum Efficiency [%]: 17.7
          Nominal Gain          : 1E+06
          Rise Time         [ps]: 350
          Jitter (Single PE)[ps]: 100
          Field of View      ["]: 360
          Date Installed        : 1986-03-31
          Date Removed          : (yyyy-mm-dd)
        Signal Processing       : CFD
          Manufacturer          : Tennelec
          Model                 : TC454
          Date Installed        : 1986-03-31
          Date Removed          : (yyyy-mm-dd)
          Amplitude Measurement : YES
          Return-rate Controlled: YES
          Mode of Operation     : Few to Multi Photons
        Time of Flight Observ.  : INTERVAL
          Manufacturer          : Hewlett-Packard
          Model                 : 5370B
          Resolution        [ps]: 20
          Precision         [ps]: 35
          Date Installed        : 1986-03-31
          Date Removed          : (yyyy-mm-dd)
        Additional Information  : (multiple lines)

6.02.01 Secondary Chain
        Wavelength          [nm]: 532
        Detector Type           : MCP
          Manufacturer          : ITT
          Model                 : F4129F
          Quantum Efficiency [%]: 17.7
          Nominal Gain          : 1E+06
          Rise Time         [ps]: 350
          Jitter (Single PE)[ps]: 100
          Field of View      ["]: 360
          Date Installed        : 1986-03-31
          Date Removed          : (yyyy-mm-dd)
        Signal Processing       : CFD
          Manufacturer          : Tennelec
          Model                 : TC454
          Date Installed        : 1986-03-31
          Date Removed          : (yyyy-mm-dd)
          Amplitude Measurement : YES
          Return-rate Controlled: YES
          Mode of Operation     : Single to Multi Photons
        Time of Flight Observ.  : INTERVAL
          Manufacturer          : Hewlett-Packard
          Model                 : 5370B
          Resolution        [ps]: 20
          Precision         [ps]: 35
          Date Installed        : 1986-03-31
          Date Removed          : (yyyy-mm-dd)
        Additional Information  : High sensivity laser receiver configuration,
                                  installed 1996-05-19. Everything is the same
                                  as the primary chain except the discriminator
                                  threshold has been lowered to accept single
```

```
                                photons and the signal is amplified with
                                24 dB of gain



7.   Tracking Capabilities

7.01 Satellites
       Very Low Alt (<400 km)   : YES
       Low Altitude (400-2000)  : YES
       Lageos                   : YES
       GLONASS                  : YES
       Etalon                   : NIGHT
       GPS                      : NIGHT
       Moon                     : NO
     Avge Pass Switch Time   [s]: 60
     Average values for Lageos
       Single Shot RMS      [mm]: 10
       # of Obs per NP           : 150
       Use of Semi-trains        : NO
       # of Semi-train Tracks    : N.A.
     Range Gate Width       [ns]: 2000
     Beam Pointing Accuracy  ["]: 0.6
     Angle Encoder Resolution["]: 0.6
     Min. Tracking Elev.   [deg]: 20
     Operation
       Months per Year           : 12
       Days per Week             : 7
       Hours per Day             : 24
       Staff per Shift           : 1
       System Shared With        : R&D
       Time Allocated to SLR [%]: 100
       Remotely Controllable     : NO
     Date First Applicable       : 1996-12-01
     Date Last Applicable        : (yyyy-mm-dd)
     Additional Information      : Station is not available for ranging
                                   on US holidays.



8.   Calibration

8.01 Calibration Type            : PRE+POST
     Target Location             : EXTERNAL
     Target Type                 : CORNER CUBE
     Target Structure            : CONCRETE PIER
     Target Distance         [m]: 170
       Date Measured             : 1998-12-12
       Accuracy (mm)        [mm]: 2
       Verification              : first order survey and
                                 : ranging to multiple ground targets
     Return-rate Controlled      : YES
     Mode of Operation           : FEW to MULTI
     Average Cal Interval  [min]: 3.5
     Single Shot RMS        [mm]: 5 +- 1
     Edit Criterion 1st Chain    : ITERATIVE 3 SIGMA
     Edit Criterion 2nd Chain    : N.A.
     Application of Cal Data     : AVERAGE
     Date Installed              : 1990-07-24
     Date Removed                : (yyyy-mm-dd)
     Additional Information      : (multiple lines)
```

9. Time and Frequency Standards

```
9.01.01 Frequency Standard Type : Rubidium disciplined by GPS
        Model                   : XL-DC 151-358-108-2
        Manufacturer            : TrueTime
        Short Term Stab.  [e-12]: 10
        Long Term Stab.   [e-12]: 3
        Time Reference          : GPS
        Synchronization         : GPS
        Epoch Accuracy      [ns]: <100
        Date Installed          : 1999-05-23
        Date Removed            : (yyyy-mm-dd)
        Additional Information  : This Truetime model contains the
                                  Stanford PRS10 Rubidium Frequency
                                  Standard

9.02.01 GPS Timing Rcvr Model   : XL-DC 151-358-108-2
        Manufacturer            : TrueTime
        Date Installed          : 1999-03-04
        Date Removed            : (yyyy-mm-dd)
        Additional Information  : CNS clock used for comparisons
```

10. Preprocessing Information

```
10.01 On-site NP Generation     : YES
      Data Screening            : IRV+POLYNOMIAL
      Edit Criterion 1st Chain  : ITERATIVE 3.0 SIGMA
      Edit Criterion 2nd Chain  : N.A.
      Upload interval           : HOURLY
      Date First Applicable     : 1991-12-09
      Date Last Applicable      : 2001-02-08
      Additional Information    : (multiple lines)

10.02 On-site NP Generation     : YES
      Data Screening            : IRV+POLYNOMIAL
      Edit Criterion 1st Chain  : ITERATIVE 3.0 SIGMA
      Edit Criterion 2nd Chain  : N.A.
      Upload interval           : HOURLY
      Date First Applicable     : 2001-02-08
      Date Last Applicable      : (yyyy-mm-dd)
      Additional Information    : Generic Normal Processing Version 2.0
                                  installed 2001-02-08.
```

11. Aircraft Detection

```
11.01 Detection Type            : RADAR
      Date Installed            : 1994-08-31
      Date Removed              : (yyyy-mm-dd)
      Additional Information    : (multiple lines)
```

12. Meteorological Instrumentation

```
12.01.01 Pressure Sensor Model  : MET3
         Manufacturer           : Paroscientific
```

```
         Recording Interval      : PER PULSE
         Accuracy          [mbar]: 0.1
         Height Diff to SRP   [m]: -0.15
         Date Installed          : 2000-03-30
         Calibration Interval    : yearly
         Date Removed            : (yyyy-mm-dd hh:mm UT)
         Additional Information  : (multiple lines)

12.02.01 Temp Sensor Model       : MET3
         Manufacturer            : Paroscientific
         Recording Interval      : PER PULSE
         Accuracy         [deg C]: 0.5
         Date Installed          : 2000-03-30
         Calibration Interval    : yearly
         Date Removed            : (yyyy-mm-dd hh:mm UT)
         Additional Information  : (multiple lines)

12.03.01 Humidity Sensor Model   : MET3
         Manufacturer            : Paroscientific
         Recording Interval      : PER PASS
         Accuracy       [% rel h]: 2
         Date Installed          : 2000-03-30
         Calibration Interval    : yearly
         Date Removed            : (yyyy-mm-dd hh:mm UT)
         Additional Information  : (multiple lines)


13.   Local Ties, Eccentricities, and Collocation Information

13.01 Collocated Permanent Geodetic Systems

      GPS                        : IGS
        Date Installed           : 1993-04-02
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      GLONASS                    : NO
        Date Installed           : (yyyy-mm-dd)
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      DORIS                      : IDS
        Date Installed           : 2000-06-29
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      PRARE                      : YES
        Date Installed           : 1995-05-01
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      VLBI                       : IVS
        Date Installed           : 1993-04-01
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      Gravimeter                 : NO
        Date Installed           : (yyyy-mm-dd)
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)

13.02.xx Local Ties from the SRP to Other Monuments or Systems on Site

         Monument Name           :
         Instrumentation Type    : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/NONE)
         Instrumentation Status  : (PERMANENT/MOBILE)
         DOMES Number            : (XXXXXXXXX)
         CDP Number              : (XXXX)
```

```
          Differential Components (ITRS)
            dx                [m]: (m +- m)
            dy                [m]: (m +- m)
            dz                [m]: (m +- m)
            Date Measured        : (yyyy-mm-dd)
            Determined by        :
          Date Installed         : (yyyy-mm-dd)
          Date Removed           : (yyyy-mm-dd)
          Additional Information : (multiple lines)

13.03.01 Eccentricities Between Other Monuments on Site

          From: Monument Name    : CDP Station 7105
                DOMES Number     : 40451M105
                CDP Number       : 7105
          To:   Monument Name    : North GEOS Pier
                DOMES Number     : 40451M110
                CDP Number       :
          Differential Components (ITRS)
            dx                [m]:  11.6967 +- 0.002
            dy                [m]:  27.9696 +- 0.002
            dz                [m]:  29.9564 +- 0.002
            Date Measured        : 1998-12-12
            Determined by        : HTSI
          Additional Information : For more information about
                                   contact Jim Long at
                                   jim.long@honeywell-tsi.com

13.03.02 Eccentricities Between Other Monuments on Site

          From: Monument Name    : CDP Station 7105
                DOMES Number     : 40451M105
                CDP Number       : 7105
          To:   Monument Name    : CDP Station 7125
                DOMES Number     : 40451M114
                CDP Number       : 7125
          Differential Components (ITRS)
            dx                [m]:  26.0377 +- 0.002
            dy                [m]: -17.4605 +- 0.002
            dz                [m]: -29.3887 +- 0.002
            Date Measured        : 1998-12-12
            Determined by        : HTSI
          Additional Information : For more information about
                                   contact Jim Long at
                                   jim.long@honeywell-tsi.com

13.03.03 Eccentricities Between Other Monuments on Site

          From: Monument Name    : CDP Station 7105
                DOMES Number     : 40451M105
                CDP Number       : 7105
          To:   Monument Name    : CDP Station 7920
                DOMES Number     : 40451M117
                CDP Number       : 7920
          Differential Components (ITRS)
            dx                [m]:  22.1812 +- 0.002
            dy                [m]: -19.2155 +- 0.002
            dz                [m]: -30.4096 +- 0.002
            Date Measured        : 1998-12-12
            Determined by        : HTSI
          Additional Information : For more information about
                                   contact Jim Long at
                                   jim.long@honeywell-tsi.com
```

13.03.04 Eccentricities Between Other Monuments on Site

```
From: Monument Name     : CDP Station 7105
      DOMES Number      : 40451M105
      CDP Number        : 7105
To:   Monument Name     : CDP Station 7130
      DOMES Number      : 40451M116
      CDP Number        : 7130
Differential Components (ITRS)
  dx                [m]:  15.5755 +- 0.002
  dy                [m]:  25.9070 +- 0.002
  dz                [m]:  25.8559 +- 0.002
  Date Measured         : 1998-12-12
  Determined by         : HTSI
Additional Information  : For more information about
                          contact Jim Long at
                          jim.long@honeywell-tsi.com
```

13.03.05 Eccentricities Between Other Monuments on Site

```
From: Monument Name     : CDP Station 7105
      DOMES Number      : 40451M105
      CDP Number        : 7105
To:   Monument Name     : CDP Station 7918
      DOMES Number      : 40451M120
      CDP Number        : 7918
Differential Components (ITRS)
  dx                [m]: -14.4196 +- 0.002
  dy                [m]:   5.1378 +- 0.002
  dz                [m]:   9.4549 +- 0.002
  Date Measured         : 1998-12-12
  Determined by         : HTSI
Additional Information  : For more information about
                          contact Jim Long at
                          jim.long@honeywell-tsi.com
```

13.03.06 Eccentricities Between Other Monuments on Site

```
From: Monument Name     : CDP Station 7105
      DOMES Number      : 40451M105
      CDP Number        : 7105
To:   Monument Name     : JPL 4006 (GPS East)
      DOMES Number      : 40451M123
      CDP Number        : 4006
Differential Components (ITRS)
  dx                [m]:  54.2314 +- 0.002
  dy                [m]:  97.0090 +- 0.002
  dz                [m]:  93.8623 +- 0.002
  Date Measured         : 1998-12-12
  Determined by         : HTSI
Additional Information  : IGS site code is GODE.
                          For more information about
                          contact Jim Long at
                          jim.long@honeywell-tsi.com
```

13.03.07 Eccentricities Between Other Monuments on Site

```
From: Monument Name     : CDP Station 7105
      DOMES Number      : 40451M105
      CDP Number        : 7105
To:   Monument Name     : SGP 7108
      DOMES Number      : 40451M125
```

```
      CDP Number        : 7108
Differential Components (ITRS)
  dx                [m]:  75.1266 +- 0.002
  dy                [m]: 116.7620 +- 0.002
  dz                [m]: 110.5077 +- 0.002
  Date Measured         : 1998-12-12
  Determined by         : HTSI
Additional Information  : 7108 is the Mobile VLBI (MV)-3 marker.
                          For more information about
                          contact Jim Long at
                          jim.long@honeywell-tsi.com
```

13.03.08 Eccentricities Between Other Monuments on Site

```
From: Monument Name     : CDP Station 7105
      DOMES Number      : 40451M105
      CDP Number        : 7105
To:   Monument Name     : JPL 4005 (GPS West)
      DOMES Number      : 40451M124
      CDP Number        : 4005
Differential Components (ITRS)
  dx                [m]: 33.3058 +- 0.002
  dy                [m]: 88.3919 +- 0.002
  dz                [m]: 88.9674 +- 0.002
  Date Measured         : 1998-12-12
  Determined by         : HTSI
Additional Information  : IGS site code is GODW.
                          For more information about
                          contact Jim Long at
                          jim.long@honeywell-tsi.com
```

13.03.09 Eccentricities Between Other Monuments on Site

```
From: Monument Name     : CDP Station 7105
      DOMES Number      : 40451M105
      CDP Number        : 7105
To:   Monument Name     : MV-3 SRP (VLBI)
      DOMES Number      : 40451M125
      CDP Number        : 7108
Differential Components (ITRS)
  dx                [m]:  75.9012 +- 0.002
  dy                [m]: 113.5125 +- 0.002
  dz                [m]: 113.2697 +- 0.002
  Date Measured         : 1998-12-12
  Determined by         : HTSI
Additional Information  : This is the system reference point
                          for MV-3. For more information
                          contact Jim Long at
                          jim.long@honeywell-tsi.com .
```

13.03.10 Eccentricities Between Other Monuments on Site

```
From: Monument Name     : CDP Station 7105
      DOMES Number      : 40451M105
      CDP Number        : 7105
To:   Monument Name     : GREB (DORIS)
      DOMES Number      : 40451S176
      CDP Number        : N.A.
Differential Components (ITRS)
  dx                [m]: -8.343 +- 0.002
  dy                [m]: -41.346 +- 0.002
```

```
          dz                [m]: -45.362 +- 0.002
          Date Measured        : 2000-01-01
          Determined by        : HTSI
        Additional Information : For more information
                                 contact Jim Long at
                                 jim.long@honeywell-tsi.com .
```

14. Local Events Possibly Affecting Computed Position

```
14.01 Date                     : (yyyy-mm-dd hh:mm UT)
      Event                    : (EARTHQUAKE/CONSTRUCTION/etc)
      Additional Information   : (multiple lines)
```

15. On-Site, Point of Contact Agency Information

```
      Agency                   : HTSI
      Mailing Address          : NASA SLR
                               : 7515 Mission Dr
                               : Lanham, Md 20706
      Primary Contact
        Contact Name           : Maceo Blount
        Telephone (primary)    : 301-286-5050
        Telephone (secondary)  :
        Fax                    : 301-286-1636
        E-mail                 : maceo.blount@honeywell-tsi.com
      Secondary Contact
        Contact Name           : Scott Wetzel
        Telephone (primary)    : 301-805-3987
        Telephone (secondary)  :
        Fax                    : 301-805-3974
        E-mail                 : Scott.Wetzel@honeywell-tsi.com
      Additional Information   : (multiple lines)
```

16. Responsible Agency (if different from 15.)

```
      Agency                   : NASA, Code 920.1
      Mailing Address          : Code 920.1
                               : NASA/GSFC
                               : Greenbelt, MD 20771 USA
      Primary Contact
        Contact Name           : David Carter
        Telephone (primary)    : 301-614-5966
        Telephone (secondary)  :
        Fax                    : 301-614-5970
        E-mail                 : dlcarter@pop900.gsfc.nasa.gov
      Secondary Contact
        Contact Name           :
        Telephone (primary)    :
        Telephone (secondary)  :
        Fax                    :
        E-mail                 :
      Additional Information   : (multiple lines)
```

17. More Information

URL for More Information	: N.A.
Hardcopy on File	
Site Map	: YES
Site Diagram	: YES
Horizon Mask	: YES
Monument Description	: YES
Site Pictures	: YES
Additional Information	: contact Jim Long at HTSI for more information at jim.long@honeywell-tsi.com

Appendix C. VLBI MV3 IVS Site Log

```
Network Station Configuration File
International VLBI Service

Refer to the instructions in the file
ftp://ivscc.gsfc.nasa.gov/config/instructions.txt
for how to fill out and submit this form.
990624 nrv Form version 0.5
990702 nrv Form version 0.6
990713 nrv Form version 0.7
991020 nrv Form version 0.8

0. Form

   Prepared by (full name) : Charles (Chuck) Kodak
   Date prepared           : 2000-Apr-19
   Report type             : new
   Prepared by (full name) : Charles (Chuck) Kodak
   Date prepared           : 2001-Apr-09
   Report type             : update
   Updated sections        : 2.2,3, 4, 6.3, 7.5(new), 13, 14

1. Site identification

   Site name               : GREENBELT
   Site 8-letter code      : GGAO7108
   Site 2-letter code(s)   : Gg
   IERS DOMES number       : 40451M125
   CDP occupation code     : 71085301
   CDP monument number     : 7108
   Surveyed into national network? : yes
   IGS station code        : GODE
   ILRS station name       : GODL
   Additional information  :

2. Site information

2.1 Site location information

   City or Town            :  Greenbelt
   State or Province       :  Maryland
   Country                 :  United States of America
   Tectonic plate          :  North American
   Approximate position
     X coordinate (m)      :  1130794.76936
     Y coordinate (m)      : -4831233.80170
     Z coordinate (m)      :  3994217.03883
     Latitude (deg)        : 39.0219 N
     Longitude (deg)       : 76.8265 W
     Elevation (m)         : 15.0
     Source of position    : local survey
   Additional information  :

2.2 Site local survey network information

   Number of reference markers  :  3
   Type of marker          :  pillar with imbedded disk
   Frequency of surveying  :  Annual
   Surveying method        :  directions, distances, leveling, GPS, etc.
```

```
   Survey instruments used :  theodolite, GPS,EDMI
   Accuracy                : (+/- 2 mm)
   Survey performed by     : Honeywell Techonlogy Solutions, Inc. formerly
                                    AlliedSignal Technical Services Corp.
   Survey documentation    : Report of Survey and HAVAGO adjustment
   Most recent survey date : 1996-Jan-05
   Results provided to IERS: yes
   Results provided to CDDIS:yes
   Person responsible      : James L. Long, Honeywell-TSI,Inc
   Additional information  :

2.3 Site descriptive information

   Electronic file available at IVSCC:
   (Please upload these files to ftp://ivscc.gsfc.nasa.gov/incoming
    and send e-mail to ivscc@ivscc.gsfc.nasa.gov telling the names.)
      ns is for Network Stations (don't change)
      Xy is station 2-letter code
      sm, sd, hm, md, sp indicate the type of file (don't change)
      NN are numbers, 01 is the first such file, 02 the second, etc.
      .type is the file type, .ps for PostScript, .jpg for JPEG, etc.
     Site map              : nsGgsmNN.type
     Site diagram          : nsGgsmNN.type
     Horizon mask diagram  : nsGgsmNN.type
     Monument description  : nsGgsmNN.type
     Site photographs      : nsGgsmNN.type
   URLs for reference
     Site map              :
     Site diagram          :
     Horizon mask          :
     Monument description  :
     Site photographs      :
   Additional information  :

3. Antenna information

   Diameter (m)            : 5
   Axis type               : AZEL
   Axis offset (m)         : 0.0
   Slew rate first axis    : 3o/s
   Slew rate second axis   : 3o/s
   Limit stops first axis  : -270o, +270o
   Limit stops second axis : 90o, 6.8o
   Horizon mask data       :
   Occupation dates        : (yyyy-mmm-dd to Present)
   Additional information  :

4. Receiver information

   Feed location           : S-Band prime focus, X-Band cassegrain focus
   Feed type               : dichroic
   X 1st-stage amplifier   : cooled HEMT
   X bandwidth (MHz)       : 800MHz, -2dB
   X Tsys at zenith (K)    : 55 K
   X SEFD (Jy)             : 24,000
   X aperture efficiency   : 45 %
   X LO frequencies (MHz)  : 8080MHz
   S 1st-stage amplifier   : uncooled HEMT
   S bandwidth (MHz)       : 240MHz, -2dB
   S Tsys at zenith (K)    : 45 K
   S SEFD (Jy)             : 26,500
   S aperture efficiency   : 42 %
   S LO frequencies (MHz)  : 2020MHz
```

```
   Phase calibrator type   : NASA/CDP with 5 MHz input and
                             temperature controller
   Additional information  :

5. Cables between receiver and back end

   Length of cable run     : 111 m
   X band cable type       : RG214
   X band freq. bandpass   : 900MHz
   S band cable type       : RG214
   S band freq. bandpass   : 300MHz
   LO ref signal cable type: RG214
   LO ref signal freq.     : 5MHz
   Phase cal ref signal cable type: RG214
   Phase cal ref signal freq. : 5MHz
   Cable meas. system type : MarkIII cable cal
   Additional information  :

6. Data acquisition system information

6.1 Video/baseband converter set (group each set of up to 16
      mixers with similar characteristics)
   Type of converters      : MarkIV
   Number of mixers        : MarkIII type has 1 mixer per converter
   Sidebands available     : U&L
   Number of mixers with
   the following filters in
   all sideband outputs:
     2 MHz                 : 15
     4 MHz                 : 15
     8 MHz                 : 15
    16 MHz                 : 15
    32 MHz                 : 0
   Additional information  :

6.1.x (add sections for each additional video/baseband converter set)

6.2 Formatter
   Formatter type          : MarkIV
   Serial number or rack ID: Formatter - Haystack 02
   Additional information  :

6.2.x (add sections for each additional formatter)

6.3 Decoder
   Decode type             : MarkIV
   Additional information  :

6.3.x (add sections for each additional decoder)

6.4 IF distribution
   IF distributor type     : MarkIII/IV+IF3
   Additional information  :

6.4.x (add sections for each additional IF distribution)

6.5 Up/down converters
   X up/down converter freq.:
   S up/down converter freq.:
   Additional information  :

6.5.x (add sections for each additional converter)
```

```
6.6 Other rack equipment   :

   Additional information  :

6.6.x (add lines or sections for other types of rack equipment)

6.7 Recorders

   Recorder type           : MarkIV
   Number of recorders     : 1
   Tape type               : thin
   Additional information  :

6.7.x (add sections for each recorder type)

6.8 Data Acquisition System Configuration Types Supported
    (list only those that are actually usable)

   6.8.1 Configuration 1   : (list elements from section 6 that
                           :  make a usable configuration)
                           : Example:
                           : 6.1.1 MKIV VCs
                           : 6.2   MKIV formatter
                           : 6.3   MKIII Decoder
                           : 6.4   MKIII IFD+IF3 distribution
                           : 6.5   None
                           : 6.7   MKIV recorder

   6.8.x (list additional configurations)

7 Meteorological instrumentation

7.1 Humidity sensor
   Manufacturer            :  WeatherMeasures
   Model                   :  5124D
   Accuracy                                    :  +/-0.5%  0-15%RH,  +/-3%  15-80%RH,
+/-6% 80-100%RH
   Effective dates         : 1982 to present
   Additional information  :

7.2 Pressure sensor
   Manufacturer            : Setra
   Model                   : B245
   Accuracy                : 650 to 1100mbar
   Effective dates         : 1982 to present
   Height relative to VLBI : 3.8m
   Additional information  :

7.3 Temperature sensor
   Manufacturer            : WeatherMeasure
   Model                   : HUP14U
   Accuracy                : +/- 1o
   Effective dates         : 1982 to present
   Additional information  :

7.4 Meteorological instrumentation (Future / Under development)
   Manufacturer            : Paroscientific,Inc.
   Model                   : MET3A
   Accuracy                : +/-0.08 hPa FS, +/-0.1 deg C FS, +/-2% RH @25C
   Effective dates         : Current Production
   Height relative to VLBI : TDB
   Additional information  :
```

```
8. Time and frequency standards

8.1
   Standard type           : H-maser
   Installed dates         : 1993 to present
   Manufacturer            : NASA / APL
   Model number or ID      : NR-12
   Additional information  :

8.x (add more sections for each standard)

9. Auxilliary equipment information

   Type of equipment       :
   Installed dates         :
   Manufacturer            :
   Model number or ID      :
   Additional information  :

9.x (add sections for additional auxilliary equipment)

10. Co-location information

10.1
   Instrument type         : Doris
   Instrument name         :
   Status                  : Permanent
   Effective dates         : NEW May, 2000
   Included in local survey: yes
   Additional information  :

10.2
   Instrument type         : Glonass
   Instrument name         : 3S Navigation (gone)
                                    Ashtech Z-18  (present)
   Status                  : Permanent
   Effective dates         : 1995 to present
   Included in local survey: yes
   Additional information  :

10.3
   Instrument type         : Prare
   Instrument name         : Dorier
   Status                  : Permanent
   Effective dates         : 1997 to present
   Included in local survey: yes
   Additional information  : INOPERATIVE

10.4
   Instrument type         : SLR
   Instrument name         : Moblas-7
   Status                  : Permanent
   Effective dates         : 1981 to present
   Included in local survey: yes
   Additional information  :

10.5
   Instrument type         : GPS
   Instrument name         : GODE (AO ACT) and GODZ (Ashtec Z-12)
   Status                  : Permanent
   Effective dates         : 1993 to present
   Included in local survey: yes
   Additional information  :
```

```
10.x (add sections for each type)

11. Field System computer information

   System vendor           : SWT
   CPU                     : PII
   CPU speed               : 200MHz
   Memory                  : 64Mbytes
   Disk                    : 1.4Gb
   Linux release           : 6.x
   Internet connection     : direct
   Antenna interface type  : serial
   Spare FS computer?      : no

12. Known RFI sources

12.1
   Center frequency        : (MHz)
   Approximate bandwidth   :
   Approximate az/el range : (give range affected by RFI)
   Additional informaiton  : (multiple lines allowed, give estimate
                              of strength of interference)

12.x (add sections for multiple RFI sources and frequencies)

13. On-site contact information

   Agency                  : Honeywell-TSI, Inc.
   Shipping address        : 7515 Mission Drive
                                     SLR/VLBI
                                     Lanham, MD 20706
   Postal address          : (if different, multiple lines)
   URL of site web page    :
   On-site Friend of VLBI
     Name                  : Jay Redmond
     Telephone (primary)   : 301.805.3972
     Telephone (alternate) : 301.805.3997
     Fax                   : 301.805.3974
     E-mail                : jay.readmond@honeywell-tsi.com


   On-site VLBI operations room
     Telephone (primary)   : 301.286.3877
     Telephone (alternate) : 301.286.0811
     Fax                   : 301.286.4075
     E-mail                : mv3@cddis.gsfc.nasa.gov
   Other on-site contact
     Name                  : Charles A. Kodak
     Telephone (primary)   : 301.805.3968
     Telephone (alternate) : 301.805.3997
     Fax                   : 301.805.3974
     E-mail                : Charles.Kodak@honeywell-tsi.com

   Additional information  : (multiple lines allowed)

14. Responsible agency (if different from on-site information)

   Agency                  :  Goddard Space Flight Center
                              Code 920.3
   Shipping address        : NASA/GSFC, Greenbelt MD 20771
   Postal address          :
   URL of agency web page  : Lupus.gsfc.nasa.gov
```

```
   Primary administrative agency contact
     Contact person        : Dr. Thomas Clark
     Telephone (primary)   : 301.614.5866
     Telephone (alternate) :
     Fax                   : 301.614.6015
     E-mail                : clark@tomcat.gsfc.nasa.gov
                             Thomas.A.Clark.1@gsfc.nasa.gov
   Alternate agency contact
     Contact person        : Bill Wildes
     Telephone (primary)   : 301.614.5967
     Telephone (alternate) :
     Fax                   : 301.614.5866
     E-mail                : wtw@gemini.gsfc.nasa.gov
   Additional information  : (multiple lines allowed)

15. More information

   Additional information  : (multiple lines allowed)
```

Appendix D. DORIS GREB IDS Site Log

```
   GREENBELT DORIS site description form

0. Form

   Prepared by       : SIMB (DORIS installation and maintenance department)
   Date prepared     : 26/07/2007
   Report type       : UPDATE

1. Site location information

   Site name               : GREENBELT
   Site DOMES number       : 40451
   Host agency             : NASA/GSFC
   City                    : Greenbelt
   State or province       : Maryland
   Country                 : U.S.A.
   Tectonic plate          : North America
   Geological information  :

   Geographical coordinates (ITRF) :
          North Latitude   :   39 deg  1' 12''
          East Longitude   :  -76 deg 49' 41''
          Ellipsoid height :   20 m
   Approximate altitude    :   52 m

2. DORIS antenna and reference point information

2.1
   Four character ID        : GREB
   Antenna model            : Starec 52291 type
   Antenna serial number    : 71
   IERS DOMES number        : 40451S176
   CNES/IGN number          : 404511
   CTDP number              : 93
   Date installed (dd/mm/yy): 29/06/2000
   Date removed (dd/mm/yy)  :
   Antenna support type     : Concrete pillar
   Installed on             :
   Height above ground mark : 0.518 m
   Ground mark type         :
   Ground mark DOMES number : 40451
   Notes                    :


3. DORIS beacons information

3.1
   Beacon serial number        : 99 04 123
   Beacon model                : 2.0
   USO serial number           : 3.182
   4 Char. ID of the REF point : GREB
   Date installed (dd/mm/yy)   : 29/06/2000
   Date removed (dd/mm/yy)     : 11/09/2005

3.2
   Beacon serial number        : 28 19 025
   Beacon model                : 3.0
   USO serial number           : 3.340
```

```
   4 Char. ID of the REF point : GREB
   Date installed (dd/mm/yy)   : 17/01/2006
   Date removed (dd/mm/yy)     :


4. ITRF coordinates and velocities of the current DORIS ref. point (GREB)

   Solution : ITRF2000 (connection to CDP 7105)
   Epoch    : 1997.0

   X = 1130711.289 m     Y = -4831391.923 m     Z = 3994061.177 m
   Sig X = 0.001 m        Sig Y = 0.002 m       Sig Z = 0.002 m

   VX = -0.0148 m/y        VY = -0.0001 m/y       VZ = 0.0010 m/y
   Sig VX = 0.0001 m/y    Sig VY = 0.0003 m/y   Sig VZ = 0.0003 m/y

5. IERS co-location information

5.1
   Instrument type       : SLR
   Status                : Permanent
   DOMES number of the
   instrument ref. point : 40451M105
   Notes                 :

5.2
   Instrument type       : GPS
   Status                : Permanent
   DOMES number of the
   instrument ref. point : 40451M123
   Notes                 :

5.3
   Instrument type       : VLBI
   Status                : Mobile
   DOMES number of the
   instrument ref. point : 40451M125
   Notes                 :

6. Tide gauge co-location information

7. Local site ties

7.1
   Point description      : DORIS mark (concrete pillar: top of plate)
   DOMES number           :

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
                  dX (m) : -0.092
                  dY (m) : 0.392
                  dZ (m) : -0.326
   Accuracy (m)           : 0.001
   Date measured          : June 2000
   Additional information : Antenna height measurement by IGN-F

7.2
   Point description      : SLR mark (CDP 7105)
   DOMES number           : 40451M105

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
                  dX (m) : 8.343
```

```
                dY (m) : 41.346
                dZ (m) : 45.362
   Accuracy (m)        : 0.001
   Date measured       : January 2000
   Additional information : Survey by Honeywell TSI

7.3
   Point description   : Mark JPL 4006 (IGS station GODE)
   DOMES number        : 40451M123

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
                dX (m) : 62.573
                dY (m) : 138.355
                dZ (m) : 139.226
   Accuracy (m)        : 0.002
   Date measured       : January 2000
   Additional information : Survey by Honeywell TSI

7.4
   Point description   : MV-3 mark (CDP 7108)
   DOMES number        : 40451M125

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
                dX (m) : 83.468
                dY (m) : 158.108
                dZ (m) : 155.871
   Accuracy (m)        : 0.003
   Date measured       : January 2000
   Additional information : Survey by Honeywell TSI

8. Meteorological Instrumentation

8.1 Humidity sensor
   Model           : HMP45D
   Manufacturer    : VAISALA
   Accuracy        : +/- 3 percents
   Notes           :

8.2 Pressure sensor
   Model           : PTU200 class B
   Manufacturer    : VAISALA
   Accuracy        : +/- 0.25 mb
   Height          : 1.65 m above the current DORIS ref. point (GREB)
   Notes           : long term stability = +/- 0.1 mb/year

8.3 Temperature sensor
   Model           : HMP45D
   Manufacturer    : VAISALA
   Accuracy        : +/- 0.5 deg C
   Notes           :


9. DORIS network contacts

   Primary contact:

   Name               : Herve FAGARD
   Agency             : Institut Geographique National
   Mailing address    : Service de Geodesie et de Nivellement
                      : 2 Avenue PASTEUR
                      : 94165 SAINT-MANDE CEDEX    FRANCE
```

Telephone : + 33 1 43 98 81 48
Fax : + 33 1 43 98 84 50
E-mail : herve (.) fagard (@) ign.fr

Secondary contact:

Name : Francois BOLDO
Agency : Institut Geographique National
Mailing address : CNES (DCT/PO/AL)
: 18 Avenue Edouard BELIN
: 31401 TOULOUSE Cedex FRANCE
Telephone : + 33 5 61 27 40 72
Fax : + 33 5 61 28 25 95
E-mail : Simb.Doris@cnes.fr

Appendix E. SLR Conventional Reference Point Observations

Translation Stage with Survey Prism on SLR Telescope

Close View Translation Stage and Prism on Trivet Plate

The translation stage assembly with the prism target is placed on the SLR telescope mount. The fine adjustment of the translation stage allows the prism target to be accurately positioned on the vertical axis of rotation while observed with an electronic theodolite and EDM instrument.

Appendix F. VLBI Conventional Reference Point Analysis

Below are the HAVAGO output listings for the VLBI antenna conventional reference point survey and the output listings from the software to "best fit" a circle to the target points on the arc scribed by the rotation of the VLBI antenna. The circle fit output shows the coordinate changes from the preliminary (assumed) circle center.

F.1.1 2002 Survey HAVAGO Output for North Quadrant (VLBI antenna azimuth at 000 degrees) and East Quadrant (VLBI antenna azimuth at 090 degrees)

```
INPUT FILE IS MV304_B2.TXT
 OUTPUT FILE IS MV304_B2.HAV



  ******************************** GGAO GREENBELT, MARYLAND ********************

 THIS ADJUSTMENT CONTAINS THE SURVEY OBSERVATIONS MADE AT THE GODDARD GEOPHYSICAL
 ASTRONOMICAL OBSERVATORY (GGAO) IN SEPTEMBER 2002.

 SURVEY OBSERVATIONS WHERE MADE TO A SPECIAL TARGET ATTACHED TO THE GGAO VLBA
 ANTENNA (MV-3). THE ANTENNA WAS ROTATED IN THE ELEVATION AND SET AT SELECTED
 ELEVATION ANGLES. IT WAS SET AT THE CARDINAL DIRECTIONS OF 0 DEGREES
 AND 90 DEGREES FOR THE OBSERVATIONS.

 FIVE SURVEY CONTROL STATIONS WHERE HELD CONSTRAINED FOR THE ADJUSTMENT. THE
 GEODETIC POSITION AND HEIGHT (ITRF2000) OF THE STATIONS WHERE OBTAINED FROM
 THE FINAL GGAO SITE HAVAGO ADJUSTMENT (GGAO03A2.DAT/GGAO03A2.OUT) ADJUSTED
 IN JUNE 2006. A PRELIMINARY GEODETIC POSITION AND HEIGHT OF THE MV3 VLBI
 ANTENNA CENTER OF ROTATION WAS HELD CONSTRAINED TO PROVIDE DATA FOR A CIRCLE
 FIT ADJUSTMENT ON THE ANTENNA SURVEY DATA. THE dn, de, AND du FROM THIS
 PRELIMINARY POSITION AND HEIGHT TO THE ACTUAL SURVEYED POSITION AND HEIGHT
 HAVE BEEN INCLUDED IN THIS ADJUSTMENT TO PROVIDE A FINAL GEODETIC POSITION
 AND HEIGHT OF THE VLBI MV3 ANTENNA CENTER OF ROTATION.

   ***MODIFIED  JUNE 2006:  ASTRO POSITION FOR STA 94 FROM HAVAGO GGAO03A2.OUT

 *



 FLAGS IN INPUT DATA:
    *  DELETED OBSERVATION
    #  DEWEIGHTED OBSERVATION
1INPUT                                                  DATE: 06-12-**  TIME: 16:43:08   PAGE    1

 STATION DATA

 STATION  GEODETIC LAT.   GEODETIC LON.    GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                    CODES
 NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON.  ELEV.     ASTR. ST. ERRORS           X             Y            Z

    42    39  1 18.93304   76 49 35.55078    13.745   .001   .001   .001              SGP 7108 (1993)        1 1 1
    42     0  0   .00       0  0   .00             10.00  15.00

    50    39  1 18.02097   76 49 37.51233    14.239   .001   .001   .001              JPL 4005 WEST          1 1 1
```

50	0	0	.00	0	0	.00		10.00	15.00				
94	39	1	19.91830	76	49	35.36084	13.764	.001	.001	.001	VLBI RM PIER A	1	1 1
94	39	1	18.24	76	49	27.09		.30	.40				
95	39	1	16.36196	76	49	38.36408	17.753	.001	.001	.001	VLBI RM PIER B	1	1 1
95	0	0	.00	0	0	.00		10.00	15.00				
96	39	1	19.44860	76	49	37.49768	12.656	.001	.001	.001	VLBI RM PIER C	1	1 1
96	0	0	.00	0	0	.00		10.00	15.00				
99	39	1	18.36753	76	49	34.47589	13.355	.001	.001	.001	7108 RM-1	1	1 1
99	0	0	.00	0	0	.00		10.00	15.00				
2001	39	1	18.93314	76	49	35.55082	18.097	.001	.001	.001	MV-3 (Preliminary)	1	1 1
2001	0	0	.00	0	0	.00		10.00	15.00				
2002	39	1	18.93314	76	49	35.55082	18.097	.000	.000	.000	MV-3 (Final)	0	0 0
2002	0	0	.00	0	0	.00		10.00	15.00				
510	39	1	19.06312	76	49	35.55016	18.767	.000	.000	.000	10 EL & 0 AZ	0	0 0
510	0	0	.00	0	0	.00		10.00	15.00				
525	39	1	19.03000	76	49	35.55016	19.717	.000	.000	.000	25 EL & 0 AZ	0	0 0
525	0	0	.00	0	0	.00		10.00	15.00				
540	39	1	19.02000	76	49	35.55016	20.567	.000	.000	.000	40 EL & 0 AZ	0	0 0
540	0	0	.00	0	0	.00		10.00	15.00				
555	39	1	19.00210	76	49	35.55016	21.237	.000	.000	.000	55 EL & 0 AZ	0	0 0
555	0	0	.00	0	0	.00		10.00	15.00				
570	39	1	19.00000	76	49	35.55016	21.697	.000	.000	.000	70 EL & 0 AZ	0	0 0
570	0	0	.00	0	0	.00		10.00	15.00				
585	39	1	18.95806	76	49	35.55016	21.919	.000	.000	.000	85 EL & 0 AZ	0	0 0
585	0	0	.00	0	0	.00		10.00	15.00				
5100	39	1	18.92805	76	49	35.55016	21.877	.000	.000	.000	100 EL & 0 AZ	0	0 0
5100	0	0	.00	0	0	.00		10.00	15.00				
5115	39	1	18.90004	76	49	35.55016	21.577	.000	.000	.000	115 EL & 0 AZ	0	0 0
5115	0	0	.00	0	0	.00		10.00	15.00				
5130	39	1	18.87803	76	49	35.55016	21.037	.000	.000	.000	130 EL & 0 AZ	0	0 0
5130	0	0	.00	0	0	.00		10.00	15.00				

1INPUT DATE: 06-12-** TIME: 16:43:08 PAGE 2

STATION DATA

STATION	GEODETIC LAT.	GEODETIC LON.	GEOD.HT.	GEOD. ST. ERRORS (M)	STATION NAME	CODES

NUMBER	ASTRONOMIC LAT.	ASTRONOMIC LON.	ELEV.	ASTR. ST. ERRORS			X	Y	Z
5145	39 1 18.82802	76 49 35.55016	20.297	.000	.000	.000	145 EL & 0 AZ		0 0 0
5145	0 0 .00	0 0 .00		10.00	15.00				
5160	39 1 18.67801	76 49 35.55016	19.407	.000	.000	.000	160 EL & 0 AZ		0 0 0
5160	0 0 .00	0 0 .00		10.00	15.00				
610	39 1 18.93307	76 49 35.39065	18.767	.000	.000	.000	10 EL & 90 AZ		0 0 0
610	0 0 .00	0 0 .00		10.00	15.00				
625	39 1 18.93307	76 49 35.41161	19.717	.000	.000	.000	25 EL & 90 AZ		0 0 0
625	0 0 .00	0 0 .00		10.00	15.00				
640	39 1 18.93307	76 49 35.43262	20.567	.000	.000	.000	40 EL & 90 AZ		0 0 0
640	0 0 .00	0 0 .00		10.00	15.00				
655	39 1 18.93307	76 49 35.46363	21.237	.000	.000	.000	55 EL & 90 AZ		0 0 0
655	0 0 .00	0 0 .00		10.00	15.00				
670	39 1 18.93307	76 49 35.49465	21.697	.000	.000	.000	70 EL & 90 AZ		0 0 0
670	0 0 .00	0 0 .00		10.00	15.00				
685	39 1 18.93307	76 49 35.54565	21.919	.001	.001	.001	85 EL & 90 AZ		1 1 1
685	0 0 .00	0 0 .00		10.00	15.00				
6100	39 1 18.93307	76 49 35.57661	21.877	.000	.000	.000	100 EL & 90 AZ		0 0 0
6100	0 0 .00	0 0 .00		10.00	15.00				
6115	39 1 18.93307	76 49 35.59765	21.577	.000	.000	.000	115 EL & 90 AZ		0 0 0
6115	0 0 .00	0 0 .00		10.00	15.00				
6130	39 1 18.93307	76 49 35.61865	21.037	.000	.000	.000	130 EL & 90 AZ		0 0 0
6130	0 0 .00	0 0 .00		10.00	15.00				
6145	39 1 18.93307	76 49 35.63965	20.297	.000	.000	.000	145 EL & 90 AZ		0 0 0
6145	0 0 .00	0 0 .00		10.00	15.00				
6160	39 1 18.93307	76 49 35.69985	19.407	.000	.000	.000	160 EL & 90 AZ		0 0 0
6160	0 0 .00	0 0 .00		10.00	15.00				

1INPUT DATE: 06-12-** TIME: 16:43:08 PAGE 3

DIRECTIONS

	FROM	TO	LIST	OBSERVED	MM	SEC.	
1	50	96	1	0 0 .00	1.0	1.0	JLL 09/02 T3000
2	50	510	1	55 26 38.05	1.0	1.0	
3	50	525	1	55 41 54.28	1.0	1.0	
4	50	540	1	56 8 48.70	1.0	1.0	
5	50	555	1	56 46 35.88	1.0	1.0	

6	50	570	1	57	32	43.52	1.0	1.0		
7	50	585	1	58	24	29.00	1.0	1.0		
8	50	96	2	0	0	.00	1.0	1.0	JLL 09/02 T3000	
9	50	5100	2	59	18	35.00	1.0	1.0		
10	50	5115	2	60	11	11.88	1.0	1.0		
11	50	5130	2	60	58	35.28	1.0	1.0		
12	50	5145	2	61	37	9.88	1.0	1.0		
13	50	5160	2	62	3	50.72	1.0	1.0		
14	50	655	2	59	52	48.32	1.0	1.0		
15	50	670	2	59	25	39.55	1.0	1.0		
-15	50	685	2	58	54	52.78	1.0	1.0		*
16	50	6100	2	58	22	14.72	1.0	1.0		
17	50	6115	2	57	50	4.05	1.0	1.0		
18	50	6130	2	57	20	48.05	1.0	1.0		
19	50	95	3	0	0	.00	1.0	1.0		
20	50	6145	3	215	34	49.05	1.0	1.0		
21	50	6160	3	215	18	2.38	1.0	1.0		
22	94	99	1	0	0	.00	1.0	1.0	NNP 09/02 T2000	
23	94	510	1	33	41	57.48	1.0	1.0		
24	94	525	1	33	35	9.58	1.0	1.0		
25	94	540	1	33	24	53.85	1.0	1.0		
26	94	555	1	33	10	20.68	1.0	1.0		
27	94	570	1	32	54	2.18	1.0	1.0		
28	94	585	1	32	37	3.35	1.0	1.0		
29	94	99	2	0	0	.00	1.0	1.0	NNP 09/02 T2000	
30	94	5100	2	32	21	2.02	1.0	1.0		
31	94	670	2	30	2	56.08	1.0	1.0	NNP 09/02 T2000	
-31	94	685	2	31	52	26.95	1.0	1.0		*
32	94	6100	2	33	43	53.70	1.0	1.0		
33	94	6115	2	35	29	17.85	1.0	1.0		
34	94	6130	2	37	1	27.45	1.0	1.0		
35	94	96	3	0	0	.00	1.0	1.0		
36	94	6145	3	299	58	57.35	1.0	1.0		
-36	94	95	4	0	0	.00	1.0	1.0	NNP 09/02 T2000	*
-36	94	685	4	67	53	47.52	1.0	1.0		*
37	94	96	5	0	0	.00	1.0	1.0	JLL 09/02 T3000	
38	94	610	5	287	9	48.02	1.0	1.0		
39	94	625	5	287	43	26.12	1.0	1.0		
40	94	640	5	288	44	10.02	1.0	1.0		
41	94	655	5	290	7	29.42	1.0	1.0		
42	95	50	1	0	0	.00	1.0	1.0		
43	95	6130	1	17	36	13.05	1.0	1.0		
44	95	6145	1	17	18	25.25	1.0	1.0		
45	95	6160	1	17	6	6.22	1.0	1.0		
46	95	99	2	0	0	.00	1.0	1.0	NNP 09/02 T2000	
47	95	555	2	343	10	27.63	1.0	1.0		
48	95	570	2	343	28	53.50	1.0	1.0		
49	95	5130	2	344	50	43.12	1.0	1.0		
50	95	5145	2	345	5	54.82	1.0	1.0		

DIRECTIONS

	FROM	TO	LIST	OBSERVED	MM	SEC.		
51	95	5160	2	345 16 26.65	1.0	1.0		
52	95	640	2	345 10 27.40	1.0	1.0		
53	95	655	2	344 52 24.70	1.0	1.0		
54	95	94	3	0 0 .00	1.0	1.0		
55	95	5115	3	7 41 2.40	1.0	1.0		
56	96	50	1	0 0 .00	1.0	1.0	JLL 9/02 T3000	
57	96	510	1	283 58 19.28	1.0	1.0		
58	96	540	1	284 55 45.75	1.0	1.0		
59	96	555	1	285 46 6.58	1.0	1.0		
60	96	570	1	286 46 1.92	1.0	1.0		
61	96	585	1	287 51 20.68	1.0	1.0		
62	96	5100	1	288 57 38.88	1.0	1.0	JLL 9/02 T3000	
63	96	5115	1	290 0 4.05	1.0	1.0		
64	96	5130	1	290 54 29.30	1.0	1.0		
65	96	5145	1	291 37 46.78	1.0	1.0		
66	96	5160	1	292 7 14.92	1.0	1.0		
67	96	670	1	287 46 30.62	1.0	1.0	JLL 09/02 T3000	
-67	96	685	1	288 7 27.48	1.0	1.0		*
68	96	6100	1	288 29 43.80	1.0	1.0		
69	96	6115	1	288 51 53.10	1.0	1.0		
70	96	94	2	0 0 .00	1.0	1.0	NNP 09/02 T2000	
71	96	6130	2	35 24 3.92	1.0	1.0		
72	96	6145	2	35 40 49.32	1.0	1.0		
73	96	6160	2	35 52 37.48	1.0	1.0		
74	99	95	1	0 0 .00	1.0	1.0	NNP 09/02 T2000	
75	99	610	1	71 50 55.60	1.0	1.0		
76	99	625	1	71 28 32.28	1.0	1.0		
77	99	640	1	70 49 14.40	1.0	1.0		
78	99	655	1	69 56 55.08	1.0	1.0		
79	99	670	1	68 56 46.50	1.0	1.0		
80	99	6100	1	66 52 27.45	1.0	1.0		
81	99	6115	1	65 56 50.12	1.0	1.0		
82	99	94	2	0 0 .00	1.0	1.0	NNP 09/02 T2000	
83	99	555	2	331 19 40.88	1.0	1.0		
84	99	570	2	330 3 22.62	1.0	1.0		
85	99	585	2	328 36 12.62	1.0	1.0		
86	99	5100	2	327 3 29.85	1.0	1.0	NNP 09/02 T2000	
87	99	5115	2	325 31 52.85	1.0	1.0		
88	99	95	3	0 0 .00	1.0	1.0	NNP 09/02 T2000	
89	99	5130	3	63 36 59.38	1.0	1.0		
90	99	5145	3	62 28 5.92	1.0	1.0		
91	99	5160	3	61 39 59.12	1.0	1.0		"

1INPUT DATE: 06-12-** TIME: 16:43:08 PAGE 5

GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	MM	SEC.	H.I.	H.T.	K1	K2
92	96	510	-1	83 9 57.12	1.0	2.0	.236	.000	.00	.00
93	50	510	-1	87 3 17.07	3.0	2.0	1.516	.000	.00	.00
94	96	525	-1	82 1 26.95	1.0	2.0	.236	.000	.00	.00
95	50	525	-1	86 2 59.60	3.0	2.0	1.516	.000	.00	.00
96	50	540	-1	85 10 15.02	3.0	2.0	1.516	.000	.00	.00
97	96	540	-1	81 3 44.72	1.0	2.0	.236	.000	.00	.00
98	96	555	-1	80 19 2.60	1.0	2.0	.236	.000	.00	.00
99	50	555	-1	84 26 39.38	3.0	2.0	1.516	.000	.00	.00
100	50	570	-1	83 55 11.72	3.0	2.0	1.516	.000	.00	.00
101	96	570	-1	79 50 7.38	1.0	2.0	.236	.000	.00	.00
102	96	585	-1	79 38 43.42	1.0	2.0	.236	.000	.00	.00
103	50	585	-1	83 38 8.72	3.0	2.0	1.516	.000	.00	.00
104	96	585	-1	79 39 1.08	1.0	2.0	.239	.000	.00	.00
105	50	585	-1	83 38 13.40	3.0	2.0	1.516	.000	.00	.00
106	96	5100	-1	79 45 35.85	1.0	2.0	.239	.000	.00	.00
107	50	5100	-1	83 37 4.12	3.0	2.0	1.516	.000	.00	.00
108	50	5115	-1	83 52 25.90	3.0	2.0	1.516	.000	.00	.00
109	96	5115	-1	80 9 25.82	1.0	2.0	.239	.000	.00	.00
110	96	5130	-1	80 48 35.80	1.0	2.0	.239	.000	.00	.00
111	50	5130	-1	84 23 35.48	3.0	2.0	1.516	.000	.00	.00
112	50	5145	-1	85 8 44.48	3.0	2.0	1.516	.000	.00	.00
113	96	5145	-1	81 40 25.50	1.0	2.0	.239	.000	.00	.00
114	96	5160	-1	82 41 25.55	1.0	2.0	.239	.000	.00	.00
115	50	5160	-1	86 4 49.08	3.0	2.0	1.516	.000	.00	.00
116	94	510	-1	80 7 39.32	1.0	2.0	.241	.000	.00	.00
117	94	525	-1	78 13 5.72	1.0	2.0	.241	.000	.00	.00
118	94	540	-1	76 45 36.65	1.0	2.0	.241	.000	.00	.00
119	94	555	-1	75 47 20.50	1.0	2.0	.241	.000	.00	.00
120	99	555	-1	78 55 19.05	3.0	2.0	1.502	.000	.00	.00
121	95	555	-1	88 15 17.45	1.0	2.0	.238	.000	.00	.00
122	95	570	-1	87 59 22.90	1.0	2.0	.238	.000	.00	.00
123	99	570	-1	77 56 14.60	3.0	2.0	1.501	.000	.00	.00
124	94	570	-1	75 20 10.88	1.0	2.0	.241	.000	.00	.00
125	94	585	-1	75 23 30.38	1.0	2.0	.241	.000	.00	.00
126	99	585	-1	77 20 18.75	3.0	2.0	1.502	.000	.00	.00
127	94	585	-1	75 23 17.52	1.0	2.0	.238	.000	.00	.00
128	99	585	-1	77 20 18.95	3.0	2.0	1.502	.000	.00	.00
129	94	5100	-1	75 54 6.82	1.0	2.0	.238	.000	.00	.00
130	99	5100	-1	77 11 15.15	3.0	2.0	1.502	.000	.00	.00
131	99	5115	-1	77 30 55.52	3.0	2.0	1.502	.000	.00	.00
132	95	5115	-1	88 0 35.40	1.0	2.0	.237	.000	.00	.00
133	95	5130	-1	88 17 51.88	1.0	2.0	.237	.000	.00	.00
134	99	5130	-1	78 19 25.58	3.0	2.0	1.502	.000	.00	.00
135	99	5145	-1	79 34 37.80	3.0	2.0	1.502	.000	.00	.00
136	95	5145	-1	88 42 22.40	1.0	2.0	.237	.000	.00	.00
137	99	5160	-1	81 11 34.68	3.0	2.0	1.502	.000	.00	.00
138	95	5160	-1	89 12 12.75	1.0	2.0	.237	.000	.00	.00

139	94	610	-1	81 10 15.40	1.0	2.0	.237	.000	.00	.00	
140	94	625	-1	79 24 45.50	1.0	2.0	.237	.000	.00	.00	
141	94	640	-1	77 52 32.55	1.0	2.0	.237	.000	.00	.00	

1INPUT DATE: 06-12-** TIME: 16:43:08 PAGE 6

GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	MM	SEC.	H.I.	H.T.	K1	K2	
142	94	655	-1	76 40 3.60	1.0	2.0	.237	.000	.00	.00	
143	50	655	-1	84 30 55.15	3.0	2.0	1.516	.000	.00	.00	
144	50	670	-1	83 58 2.85	3.0	2.0	1.516	.000	.00	.00	
145	96	670	-1	80 10 6.75	1.0	2.0	.239	.000	.00	.00	
-145	96	685	-1	79 44 24.33	1.0	2.0	.239	.000	.00	.00	*
-145	50	685	-1	83 38 53.48	3.0	2.0	1.516	.000	.00	.00	*
146	50	6100	-1	83 35 21.52	3.0	2.0	1.516	.000	.00	.00	
147	96	6100	-1	79 35 21.60	1.0	2.0	.239	.000	.00	.00	
148	96	6115	-1	79 44 25.95	1.0	2.0	.239	.000	.00	.00	
149	50	6115	-1	83 48 28.12	3.0	2.0	1.516	.000	.00	.00	
150	50	6130	-1	84 17 58.22	3.0	2.0	1.516	.000	.00	.00	
151	95	6130	-1	88 18 9.42	1.0	2.0	.238	.000	.00	.00	
152	95	6145	-1	88 42 33.82	1.0	2.0	.238	.000	.00	.00	
153	50	6145	-1	85 2 27.55	3.0	2.0	1.516	.000	.00	.00	
154	50	6160	-1	85 58 54.02	3.0	2.0	1.516	.000	.00	.00	
155	99	610	-1	82 10 45.72	3.0	2.0	1.502	.000	.00	.00	
156	99	625	-1	80 20 41.80	3.0	2.0	1.502	.000	.00	.00	
157	99	640	-1	78 50 29.15	3.0	2.0	1.502	.000	.00	.00	
158	95	640	-1	88 37 36.72	1.0	2.0	.237	.000	.00	.00	
159	95	655	-1	88 15 1.22	1.0	2.0	.237	.000	.00	.00	
160	99	655	-1	77 46 55.72	3.0	2.0	1.502	.000	.00	.00	
161	99	670	-1	77 12 54.58	3.0	2.0	1.502	.000	.00	.00	
162	94	670	-1	75 52 6.78	1.0	2.0	.239	.000	.00	.00	
-162	94	685	-1	75 31 46.20	1.0	2.0	.239	.000	.00	.00	*
-162	94	685	-1	77 8 38.28	1.0	2.0	.238	.000	.00	.00	*
163	99	6100	-1	77 32 24.22	3.0	2.0	1.502	.000	.00	.00	
164	94	6100	-1	75 39 55.88	1.0	2.0	.238	.000	.00	.00	
165	94	6115	-1	76 15 44.55	1.0	2.0	.238	.000	.00	.00	
166	99	6115	-1	78 20 34.92	3.0	2.0	1.502	.000	.00	.00	
167	94	6130	-1	77 16 27.00	1.0	2.0	.238	.000	.00	.00	
168	96	6130	-1	80 12 4.92	1.0	2.0	.240	.000	.00	.00	
169	96	6145	-1	80 57 21.18	1.0	2.0	.240	.000	.00	.00	
170	94	6145	-1	78 38 4.65	1.0	2.0	.238	.000	.00	.00	
171	95	6160	-1	89 12 25.65	1.0	2.0	.238	.000	.00	.00	
172	96	6160	-1	81 57 19.80	1.0	2.0	.240	.000	.00	.00	

1INPUT DATE: 06-12-** TIME: 16:43:08 PAGE 7

ELEVATION DIFFERENCES

	FROM	TO	OBSERVED	S.E.	
173	42	99	-.388	.001	HAVAGO GGAO03A2

174	99	94	.407	.001	HAVAGO GGAO03A2
175	42	94	.019	.001	" "
176	42	96	-1.091	.001	" "
177	99	50	.882	.001	" "
178	94	96	-1.109	.001	" "
179	50	96	-1.584	.001	" "
180	95	96	-5.097	.001	" "
181	50	95	3.513	.001	" "

POSITION DIFFERENCES (METERS)

	FROM	TO	LAT.	S.E.	LON.	S.E.	HEIGHT	S.E.	
182	2001	2002	.0324	.0010	-.0156	.0010	-.0259	.0010	CFIT Adj 06/29/06

ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

	FROM	TO
183	94	42
184	94	50
185	94	95
186	94	96
187	94	99
188	94	510
189	94	525
190	94	540
191	94	555
192	94	570
193	94	585
194	94	610
195	94	625
196	94	640
197	94	655
198	94	670
199	94	685
200	94	2001
201	94	2002
202	94	5100
203	94	5115
204	94	5130
205	94	5145
206	94	5160
207	94	6100
208	94	6115
209	94	6130
210	94	6145
211	94	6160

A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

	VECTOR SUM OF	
DIRECTIONS	1.0 MM	1.0 SEC.
AZIMUTHS	2.0 MM	1.3 SEC.
RECIPROCAL VERTICAL ANGLES	7.0 MM	9.0 SEC.
GROUPED VERTICAL ANGLES	3.0 MM	5.0 SEC.
ABSOLUTE DISTANCES	5.0 MM	9.9 PPM
RELATIVE DISTANCES	5.0 MM	9.9 PPM

JOB STATISTICS

ELLIPSOID: ITRF2000 A = 6378137.000 1/F = 298.2572221

STANDARD ERROR OF UNIT WEIGHT = .82, VARIANCE = .68, 103 DEGREES OF FREEDOM.

269	OBSERVATIONS	2	ITERATIONS
91	DIRECTIONS	30	STATIONS
0	ASTR. AZIMUTHS	166	UNKNOWNS
0	REC. VERTICAL ANGLES	15	LISTS OF DIRECTIONS
81	GROUPED VERTICAL ANGLES	1	REFRACTION UNKNOWNS
0	ABSOLUTE DISTANCES	0	SCALE UNKNOWNS
0	RELATIVE DISTANCES		
9	ELEVATION DIFFERENCES		
1	LAT., LON., HEIGHT DIFFERENCES		
0	PLANE DISTANCES		
1	OBSERVED ASTR. LATITUDES		
1	OBSERVED ASTR. LONGITUDES		
8	CONSTRAINED GEOD. LATITUDES		
8	CONSTRAINED GEOD. LONGITUDES		
8	CONSTRAINED GEOD. HEIGHTS		
29	ASTR. POSITION DIFFERENCES		

DK/DH ASSUMED AS -.010/1000 IF K VALUES NOT INPUT.

SELECTED OPTIONS:

CC FLAG OPTION

31 9 ITERATIONS

ADJUSTED DATA: STATIONS

STATION		LATITUDE	SIGMA	LONGITUDE	SIGMA	HEIGHT	SIGMA
42	SGP 7108 (1993)	39 1 18.93304	.00003	76 49 35.55078	.00003	13.745	.000
50	JPL 4005 WEST	39 1 18.02098	.00002	76 49 37.51236	.00002	14.240	.000
94	VLBI RM PIER A	39 1 19.91828	.00002	76 49 35.36082	.00003	13.763	.000
95	VLBI RM PIER B	39 1 16.36197	.00003	76 49 38.36407	.00003	17.753	.000
96	VLBI RM PIER C	39 1 19.44858	.00002	76 49 37.49770	.00003	12.656	.000
99	7108 RM-1	39 1 18.36755	.00002	76 49 34.47587	.00003	13.355	.000
2001	MV-3 (Preliminary)	39 1 18.93314	.00003	76 49 35.55082	.00003	18.097	.001
2002	MV-3 (Final)	39 1 18.93419	.00004	76 49 35.55017	.00005	18.071	.001
510	10 EL & 0 AZ	39 1 19.05752	.00003	76 49 35.54951	.00004	18.690	.001
525	25 EL & 0 AZ	39 1 19.04774	.00005	76 49 35.54936	.00005	19.682	.001
540	40 EL & 0 AZ	39 1 19.03033	.00003	76 49 35.54963	.00004	20.535	.001
555	55 EL & 0 AZ	39 1 19.00633	.00003	76 49 35.54966	.00003	21.218	.001
570	70 EL & 0 AZ	39 1 18.97749	.00003	76 49 35.54979	.00003	21.687	.001
585	85 EL & 0 AZ	39 1 18.94565	.00003	76 49 35.54987	.00004	21.909	.001
5100	100 EL & 0 AZ	39 1 18.91297	.00003	76 49 35.55004	.00004	21.869	.001
5115	115 EL & 0 AZ	39 1 18.88179	.00002	76 49 35.55019	.00004	21.570	.001
5130	130 EL & 0 AZ	39 1 18.85422	.00002	76 49 35.55023	.00004	21.033	.001
5145	145 EL & 0 AZ	39 1 18.83206	.00002	76 49 35.55030	.00004	20.292	.001
5160	160 EL & 0 AZ	39 1 18.81686	.00002	76 49 35.55035	.00004	19.401	.001
610	10 EL & 90 AZ	39 1 18.93359	.00005	76 49 35.39222	.00005	18.718	.001
625	25 EL & 90 AZ	39 1 18.93359	.00005	76 49 35.40458	.00004	19.679	.001
640	40 EL & 90 AZ	39 1 18.93361	.00003	76 49 35.42688	.00004	20.533	.001
655	55 EL & 90 AZ	39 1 18.93371	.00003	76 49 35.45763	.00004	21.217	.001
670	70 EL & 90 AZ	39 1 18.93382	.00003	76 49 35.49461	.00004	21.687	.001
685	85 EL & 90 AZ	39 1 18.93307	.00003	76 49 35.54565	.00003	21.919	.001
6100	100 EL & 90 AZ	39 1 18.93407	.00003	76 49 35.57725	.00004	21.869	.001
6115	115 EL & 90 AZ	39 1 18.93420	.00002	76 49 35.61726	.00004	21.571	.001
6130	130 EL & 90 AZ	39 1 18.93427	.00003	76 49 35.65267	.00004	21.034	.001
6145	145 EL & 90 AZ	39 1 18.93438	.00003	76 49 35.68105	.00004	20.294	.001
6160	160 EL & 90 AZ	39 1 18.93443	.00003	76 49 35.70054	.00006	19.402	.001

ADJUSTED DATA: DIRECTIONS

	FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.	
1	50	96	1	0 0 .00	2.43	.51	0 0 .00	44.054	0 27 37.71	92 3 40.11	JLL 09/02 T3000

2	50	510	1	55	26	38.05	2.21	.59	55	26	37.83	57.193	55	54	15.53	85 32 11.24	
3	50	525	1	55	41	54.28	-.29	-.08	55	41	51.56	57.114	56	9	29.27	84 31 52.72	
4	50	540	1	56	8	48.70	-1.58	-.42	56	8	44.69	56.901	56	36	22.40	83 38 52.96	
5	50	555	1	56	46	35.88	-.54	-.14	56	46	32.91	56.579	57	14	10.61	82 54 52.21	
6	50	570	1	57	32	43.52	-3.01	-.79	57	32	38.08	56.164	58	0	15.79	82 22 47.14	
7	50	585	1	58	24	29.00	1.68	.44	58	24	28.25	55.683	58	52	5.96	82 4 58.34	
8	50	96	2	0	0	.00	-2.72	-.57	0	0	.00	44.054	0	27	37.71	92 3 40.11	JLL 09/02 T3000
9	50	5100	2	59	18	35.00	-.27	-.07	59	18	37.44	55.165	59	46	15.15	82 2 59.42	
10	50	5115	2	60	11	11.88	.43	.11	60	11	15.03	54.647	60	38	52.74	82 17 27.89	
11	50	5130	2	60	58	35.28	-.34	-.09	60	58	37.65	54.169	61	26	15.36	82 47 43.49	
12	50	5145	2	61	37	9.88	-.65	-.16	61	37	11.95	53.758	62	4	49.66	83 32 6.19	
13	50	5160	2	62	3	50.72	2.07	.52	62	3	55.51	53.447	62	31	33.21	84 27 27.25	
14	50	655	2	59	52	48.32	1.29	.35	59	52	52.33	57.306	60	20	30.03	83 0 21.43	
15	50	670	2	59	25	39.55	.68	.18	59	25	42.95	56.602	59	53	20.66	82 26 21.87	
16	50	6100	2	58	22	14.72	-1.09	-.28	58	22	16.35	54.936	58	49	54.06	82 0 59.89	
17	50	6115	2	57	50	4.05	-1.06	-.27	57	50	5.70	54.084	58	17	43.41	82 12 32.45	
18	50	6130	2	57	20	48.05	.66	.17	57	20	51.43	53.298	57	48	29.14	82 40 31.01	
19	50	95	3	0	0	.00	1.49	.38	0	0	.00	55.222	201	49	35.66	86 21 12.54	
20	50	6145	3	215	34	49.05	.59	.15	215	34	48.16	52.638	57	24	23.82	83 23 41.88	
21	50	6160	3	215	18	2.38	-2.26	-.55	215	17	58.63	52.151	57	7	34.29	84 19 6.20	
22	94	99	1	0	0	.00	-1.78	-.44	0	0	.00	52.347	156	0	17.63	90 26 43.88	NNP 09/02 T2000
23	94	510	1	33	41	57.48	3.30	.43	33	42	2.56	27.376	189	42	20.19	79 37 50.68	
24	94	525	1	33	35	9.58	-.54	-.07	33	35	10.83	27.862	189	35	28.46	77 44 1.08	
25	94	540	1	33	24	53.85	-2.02	-.28	33	24	53.61	28.571	189	25	11.24	76 17 22.51	
26	94	555	1	33	10	20.68	-.26	-.04	33	10	22.20	29.447	189	10	39.83	75 20 1.79	
27	94	570	1	32	54	2.18	3.24	.47	32	54	7.20	30.416	188	54	24.83	74 53 56.10	
28	94	585	1	32	37	3.35	1.53	.23	32	37	6.67	31.411	188	37	24.30	74 58 8.30	
29	94	99	2	0	0	.00	1.72	.42	0	0	.00	52.347	156	0	17.63	90 26 43.88	NNP 09/02 T2000
30	94	5100	2	32	21	2.02	-1.28	-.20	32	20	59.02	32.366	188	21	16.65	75 29 42.64	
31	94	670	2	30	2	56.08	.56	.08	30	2	54.92	31.540	186	3	12.55	75 26 58.87	NNP 09/02 T2000
32	94	6100	2	33	43	53.70	-1.80	-.28	33	43	50.18	31.843	189	44	7.81	75 15 7.28	
33	94	6115	2	35	29	17.85	-1.72	-.26	35	29	14.41	31.937	191	29	32.04	75 50 55.32	
34	94	6130	2	37	1	27.45	-.16	-.02	37	1	25.57	31.984	193	1	43.20	76 51 31.99	
35	94	96	3	0	0	.00	-.12	-.03	0	0	.00	53.417	254	15	53.07	91 11 19.65	
36	94	6145	3	299	58	57.35	.33	.05	299	58	57.81	31.978	194	14	50.88	78 12 55.23	
37	94	96	5	0	0	.00	3.82	.96	0	0	.00	53.417	254	15	53.07	91 11 19.65	JLL 09/02 T3000
38	94	610	5	287	9	48.02	-.39	-.06	287	9	43.81	30.777	181	25	36.88	80 44 4.35	
39	94	625	5	287	43	26.12	-.49	-.07	287	43	21.81	30.955	181	59	14.88	78 58 51.56	
40	94	640	5	288	44	10.02	-8.06	-1.20	288	43	58.15	31.151	182	59	51.21	77 26 50.07	
41	94	655	5	290	7	29.42	-1.81	-.27	290	7	23.80	31.350	184	23	16.86	76 14 40.52	
42	95	50	1	0	0	.00	-.16	-.04	0	0	.00	55.222	21	49	35.13	93 38 49.24	
43	95	6130	1	17	36	13.05	-.54	-.24	17	36	12.67	102.749	39	25	47.80	88 10 10.20	

ADJUSTED DATA: DIRECTIONS

	FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.	
44	95	6145	1	17 18 25.25	-.37	-.16	17 18 25.05	102.298	39 8 .17	88 34 34.81	
45	95	6160	1	17 6 6.22	.97	.43	17 6 7.35	101.986	38 55 42.48	89 4 22.81	
46	95	99	2	0 0 .00	-.13	-.06	0 0 .00	112.218	56 31 37.17	92 14 43.13	NNP 09/02 T2000
47	95	555	2	343 10 27.63	1.06	.49	343 10 28.82	106.045	39 42 6.00	88 7 37.21	
48	95	570	2	343 28 53.50	3.44	1.57	343 28 57.07	105.377	40 0 34.24	87 51 36.49	
49	95	5130	2	344 50 43.12	.12	.05	344 50 43.37	102.466	41 22 20.54	88 9 55.33	
50	95	5145	2	345 5 54.82	-.08	-.03	345 5 54.87	101.932	41 37 32.04	88 34 19.86	
51	95	5160	2	345 16 26.65	-1.29	-.57	345 16 25.48	101.564	41 48 2.66	89 4 10.73	
52	95	640	2	345 10 27.40	-2.10	-.96	345 10 25.43	106.250	41 42 2.60	88 30 .77	
53	95	655	2	344 52 24.70	-1.08	-.49	344 52 23.75	105.782	41 24 .93	88 7 22.50	
54	95	94	3	0 0 .00	-.02	-.01	0 0 .00	131.387	33 22 34.72	91 44 24.94	
55	95	5115	3	7 41 2.40	.03	.01	7 41 2.46	103.125	41 3 37.18	87 52 42.84	
56	96	50	1	0 0 .00	.64	.13	0 0 .00	44.054	180 27 37.72	87 56 21.32	JLL 9/02 T3000
57	96	510	1	283 58 19.28	-1.88	-.43	283 58 16.76	48.766	104 25 54.48	82 53 26.60	
58	96	540	1	284 55 45.75	1.32	.31	284 55 46.43	49.239	105 23 24.15	80 47 29.25	
59	96	555	1	285 46 6.58	-3.21	-.75	285 46 2.73	49.551	106 13 40.45	80 2 53.28	
60	96	570	1	286 46 1.92	-4.14	-.97	286 45 57.14	49.883	107 13 34.86	79 34 5.31	
61	96	585	1	287 51 20.68	-1.50	-.36	287 51 18.54	50.216	108 18 56.25	79 22 49.51	
62	96	5100	1	288 57 38.88	-1.15	-.27	288 57 37.09	50.525	109 25 14.81	79 29 31.95	JLL 9/02 T3000
63	96	5115	1	290 0 4.05	-.25	-.06	290 0 3.17	50.791	110 27 40.88	79 53 28.16	
64	96	5130	1	290 54 29.30	2.07	.50	290 54 30.73	50.998	111 22 8.45	80 32 41.23	
65	96	5145	1	291 37 46.78	3.65	.88	291 37 49.79	51.130	112 5 27.51	81 24 34.81	
66	96	5160	1	292 7 14.92	2.61	.63	292 7 16.89	51.180	112 34 54.60	82 25 31.47	
67	96	670	1	287 46 30.62	-1.11	-.27	287 46 28.87	51.530	108 14 6.59	79 54 19.92	JLL 09/02 T3000
68	96	6100	1	288 29 43.80	1.38	.32	288 29 44.54	49.707	108 57 22.26	79 19 2.53	
69	96	6115	1	288 51 53.10	1.44	.33	288 51 53.90	48.757	109 19 31.62	79 27 48.32	
70	96	94	2	0 0 .00	-.47	-.12	0 0 .00	53.417	74 15 51.72	88 48 42.07	NNP 09/02 T2000
71	96	6130	2	35 24 3.92	-.54	-.12	35 24 3.84	47.871	109 39 55.56	79 55 7.74	
72	96	6145	2	35 40 49.32	.31	.07	35 40 50.10	47.112	109 56 41.82	80 40 6.67	
73	96	6160	2	35 52 37.48	.86	.19	35 52 38.81	46.539	110 8 30.53	81 39 49.46	
74	99	95	1	0 0 .00	.34	.16	0 0 .00	112.218	236 31 39.62	87 45 20.49	NNP 09/02 T2000
75	99	610	1	71 50 55.60	-.43	-.06	71 50 54.83	28.625	308 22 34.45	79 12 11.69	
76	99	625	1	71 28 32.28	-.54	-.07	71 28 31.41	29.048	308 0 11.03	77 25 37.00	
77	99	640	1	70 49 14.40	-6.70	-.95	70 49 7.36	29.658	307 20 46.98	75 59 43.44	
78	99	655	1	69 56 55.08	-1.52	-.22	69 56 53.22	30.404	306 28 32.85	75 0 54.91	
79	99	670	1	68 56 46.50	1.00	.15	68 56 47.17	31.224	305 28 26.79	74 31 32.41	
80	99	6100	1	66 52 27.45	1.77	.28	66 52 28.89	32.858	303 24 8.51	74 59 2.63	
81	99	6115	1	65 56 50.12	1.66	.27	65 56 51.45	33.567	302 28 31.07	75 50 2.55	
82	99	94	2	0 0 .00	2.76	.68	0 0 .00	52.347	336 0 18.19	89 33 17.82	NNP 09/02 T2000
83	99	555	2	331 19 40.88	-4.89	-.78	331 19 33.24	33.423	307 19 51.42	76 23 40.04	
84	99	570	2	330 3 22.62	-3.98	-.63	330 3 15.88	33.024	306 3 34.07	75 23 17.44	

85	99	585	2	328 36 12.62	2.88	.45	328 36 12.74	32.534	304 36 30.93	74 45 29.03						
86	99	5100	2	327 3 29.85	-.63	-.10	327 3 26.47	31.986	303 3 44.65	74 33 51.71	NNP 09/02 T2000					
87	99	5115	2	325 31 52.85	.11	.02	325 31 50.21	31.414	301 32 8.39	74 50 34.65						

ADJUSTED DATA: DIRECTIONS

FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.	
88	99	95	3 0 0 .00	-1.26	-.60	0 0 .00	112.218	236 31 39.62	87 45 20.49	NNP 09/02 T2000
89	99	5130	3 63 36 59.38	3.07	.45	63 37 3.71	30.856	300 8 43.33	75 35 38.94	
90	99	5145	3 62 28 5.92	5.21	.76	62 28 12.39	30.354	298 59 52.01	76 47 25.85	
91	99	5160	3 61 39 59.12	5.38	.77	61 40 5.77	29.944	298 11 45.39	78 21 8.92	"

ADJUSTED DATA: GROUPED VERTICAL ANGLES

FROM	TO	LIST	OBSERVED	REF/KM	V	N.V	ADJUSTED	DIST.	AZ.
92	96	510	-1 82 53 26.00	.00	.59	.13	82 53 26.60	48.766	104 25 54.48
93	50	510	-1 85 32 16.25	.00	-5.01	-.45	85 32 11.24	57.193	55 54 15.53
94	96	525	-1 81 45 2.66	.00	-.58	-.12	81 45 2.09	48.977	104 46 34.30
95	50	525	-1 84 31 56.98	.00	-4.27	-.39	84 31 52.72	57.114	56 9 29.27
96	50	540	-1 83 38 58.39	.00	-5.42	-.49	83 38 52.96	56.901	56 36 22.40
97	96	540	-1 80 47 28.09	.00	1.15	.25	80 47 29.25	49.239	105 23 24.15
98	96	555	-1 80 2 54.19	.00	-.91	-.20	80 2 53.28	49.551	106 13 40.45
99	50	555	-1 82 54 57.94	.00	-5.73	-.51	82 54 52.21	56.579	57 14 10.61
100	50	570	-1 82 22 54.79	.00	-7.65	-.68	82 22 47.14	56.164	58 0 15.79
101	96	570	-1 79 34 6.83	.00	-1.52	-.33	79 34 5.31	49.883	107 13 34.86
102	96	585	-1 79 22 49.82	.00	-.30	-.07	79 22 49.51	50.216	108 18 56.25
103	50	585	-1 82 5 6.99	.00	-8.66	-.76	82 4 58.34	55.683	58 52 5.96
104	96	585	-1 79 22 55.34	.00	-5.83	-1.28	79 22 49.51	50.216	108 18 56.25
105	50	585	-1 82 5 11.67	.00	-13.34	-1.18	82 4 58.34	55.683	58 52 5.96
106	96	5100	-1 79 29 35.69	.00	-3.74	-.82	79 29 31.95	50.525	109 25 14.81
107	50	5100	-1 82 3 10.13	.00	-10.71	-.94	82 2 59.42	55.165	59 46 15.15
108	50	5115	-1 82 17 35.77	.00	-7.88	-.68	82 17 27.89	54.647	60 38 52.74
109	96	5115	-1 79 53 29.51	.00	-1.34	-.30	79 53 28.16	50.791	110 27 40.88
110	96	5130	-1 80 32 41.55	.00	-.31	-.07	80 32 41.23	50.998	111 22 8.45
111	50	5130	-1 82 47 49.70	.00	-6.21	-.53	82 47 43.49	54.169	61 26 15.36
112	50	5145	-1 83 32 7.81	.00	-1.62	-.14	83 32 6.19	53.758	62 4 49.66
113	96	5145	-1 81 24 31.50	.00	3.31	.73	81 24 34.81	51.130	112 5 27.51
114	96	5160	-1 82 25 30.16	.00	1.31	.29	82 25 31.47	51.180	112 34 54.60
115	50	5160	-1 84 27 31.40	.00	-4.15	-.35	84 27 27.25	53.447	62 31 33.21
116	94	510	-1 79 37 50.40	.00	.29	.04	79 37 50.68	27.376	189 42 20.19
117	94	525	-1 77 43 59.16	.00	1.92	.25	77 44 1.08	27.862	189 35 28.46
118	94	540	-1 76 17 23.00	.00	-.49	-.07	76 17 22.51	28.571	189 25 11.24
119	94	555	-1 75 20 4.01	.00	-2.23	-.31	75 20 1.79	29.447	189 10 39.83
120	99	555	-1 76 23 39.51	.00	.54	.03	76 23 40.04	33.423	307 19 51.42
121	95	555	-1 88 7 34.74	.00	2.47	.89	88 7 37.21	106.045	39 42 6.00
122	95	570	-1 87 51 37.32	.00	-.83	-.30	87 51 36.49	105.377	40 0 34.24
123	99	570	-1 75 23 23.63	.00	-6.19	-.32	75 23 17.44	33.024	306 3 34.07

124	94	570	-1	74	53	49.77	.00	6.33	.89	74	53	56.10	30.416	188 54 24.83
125	94	585	-1	74	57	58.96	.00	9.34	1.36	74	58	8.30	31.411	188 37 24.30
126	99	585	-1	74	45	24.61	.00	4.43	.23	74	45	29.03	32.534	304 36 30.93
127	94	585	-1	74	58	5.20	.00	3.10	.45	74	58	8.30	31.411	188 37 24.30
128	99	585	-1	74	45	24.81	.00	4.23	.22	74	45	29.03	32.534	304 36 30.93
129	94	5100	-1	75	29	35.72	.00	6.92	1.03	75	29	42.64	32.366	188 21 16.65
130	99	5100	-1	74	33	47.15	.00	4.56	.23	74	33	51.71	31.986	303 3 44.65
131	99	5115	-1	74	50	23.02	.00	11.62	.58	74	50	34.65	31.414	301 32 8.39
132	95	5115	-1	87	52	41.65	.00	1.19	.42	87	52	42.84	103.125	41 3 37.18
133	95	5130	-1	88	9	55.01	.00	.32	.11	88	9	55.33	102.466	41 22 20.54
134	99	5130	-1	75	35	29.19	.00	9.75	.48	75	35	38.94	30.856	300 8 43.33
135	99	5145	-1	76	47	15.52	.00	10.33	.50	76	47	25.85	30.354	298 59 52.01
136	95	5145	-1	88	34	22.94	.00	-3.08	-1.08	88	34	19.86	101.932	41 37 32.04
137	99	5160	-1	78	21	6.10	.00	2.82	.13	78	21	8.92	29.944	298 11 45.39
138	95	5160	-1	89	4	11.47	.00	-.75	-.26	89	4	10.73	101.564	41 48 2.66
139	94	610	-1	80	44	5.83	.00	-1.48	-.21	80	44	4.35	30.777	181 25 36.88
140	94	625	-1	78	58	53.14	.00	-1.58	-.23	78	58	51.56	30.955	181 59 14.88
141	94	640	-1	77	26	58.29	.00	-8.22	-1.19	77	26	50.07	31.151	182 59 51.21

ADJUSTED DATA: GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	REF/KM	V	N.V	ADJUSTED	DIST.	AZ.
142	94	655	-1	76 14 46.32	.00	-5.81	-.84	76 14 40.52	31.350	184 23 16.86
143	50	655	-1	83 0 22.90	.00	-1.47	-.13	83 0 21.43	57.306	60 20 30.03
144	50	670	-1	82 26 28.34	.00	-6.47	-.58	82 26 21.87	56.602	59 53 20.66
145	96	670	-1	79 54 24.13	.00	-4.21	-.94	79 54 19.92	51.530	108 14 6.59
146	50	6100	-1	82 1 4.40	.00	-4.51	-.39	82 0 59.89	54.936	58 49 54.06
147	96	6100	-1	79 19 6.17	.00	-3.64	-.79	79 19 2.53	49.707	108 57 22.26
148	96	6115	-1	79 27 51.04	.00	-2.72	-.58	79 27 48.32	48.757	109 19 31.62
149	50	6115	-1	82 12 39.40	.00	-6.96	-.60	82 12 32.45	54.084	58 17 43.41
150	50	6130	-1	82 40 39.51	.00	-8.50	-.72	82 40 31.01	53.298	57 48 29.14
151	95	6130	-1	88 10 11.85	.00	-1.65	-.58	88 10 10.20	102.749	39 25 47.80
152	95	6145	-1	88 34 34.06	.00	.75	.26	88 34 34.81	102.298	39 8 .17
153	50	6145	-1	83 23 48.42	.00	-6.54	-.55	83 23 41.88	52.638	57 24 23.82
154	50	6160	-1	84 19 11.95	.00	-5.75	-.48	84 19 6.20	52.151	57 7 34.29
155	99	610	-1	79 11 58.35	.00	13.34	.61	79 12 11.69	28.625	308 22 34.45
156	99	625	-1	77 25 22.90	.00	14.10	.65	77 25 37.00	29.048	308 0 11.03
157	99	640	-1	75 59 36.34	.00	7.10	.33	75 59 43.44	29.658	307 20 46.98
158	95	640	-1	88 29 56.76	.00	4.01	1.44	88 30 .77	106.250	41 42 2.60
159	95	655	-1	88 7 19.31	.00	3.19	1.14	88 7 22.50	105.782	41 24 .93
160	99	655	-1	75 0 52.86	.00	2.05	.10	75 0 54.91	30.404	306 28 32.85
161	99	670	-1	74 31 34.89	.00	-2.47	-.12	74 31 32.41	31.224	305 28 26.79
162	94	670	-1	75 26 51.06	.00	7.81	1.14	75 26 58.87	31.540	186 3 12.55
163	99	6100	-1	74 58 54.48	.00	8.15	.43	74 59 2.63	32.858	303 24 8.51
164	94	6100	-1	75 15 2.21	.00	5.06	.75	75 15 7.28	31.843	189 44 7.81
165	94	6115	-1	75 50 51.38	.00	3.95	.58	75 50 55.32	31.937	191 29 32.04
166	99	6115	-1	75 49 52.71	.00	9.84	.53	75 50 2.55	33.567	302 28 31.07
167	94	6130	-1	76 51 29.82	.00	2.17	.32	76 51 31.99	31.984	193 1 43.20
168	96	6130	-1	79 55 5.88	.00	1.85	.39	79 55 7.74	47.871	109 39 55.56

169	96	6145	-1	80 40 3.46	.00	3.21	.67	80 40 6.67	47.112	109 56 41.82			
170	94	6145	-1	78 12 59.61	.00	-4.38	-.65	78 12 55.23	31.978	194 14 50.88			
171	95	6160	-1	89 4 24.35	.00	-1.53	-.54	89 4 22.81	101.986	38 55 42.48			
172	96	6160	-1	81 39 46.55	.00	2.91	.60	81 39 49.46	46.539	110 8 30.53			

ADJUSTED ELEVATION DIFFERENCES

	FROM	TO	MEASURED	V	N.V	ADJUSTED	E L E V A T I O N S	
173	42	99	-.3884	-.0004	-.38	-.3888	HAVAGO GGAO03A2	
174	99	94	.4070	-.0002	-.18	.4068	HAVAGO GGAO03A2	
175	42	94	.0186	-.0006	-.55	.0180	"	"
176	42	96	-1.0906	.0006	.64	-1.0900	"	"
177	99	50	.8818	.0013	1.31	.8831	"	"
178	94	96	-1.1092	.0012	1.19	-1.1080	"	"
179	50	96	-1.5840	-.0003	-.30	-1.5843	"	"
180	95	96	-5.0970	.0003	.30	-5.0967	"	"
181	50	95	3.5130	-.0006	-.59	3.5124	"	"

ADJUSTED POSITION DIFFERENCES (METERS)

	FROM	TO	LAT.	V	LON.	V	H	V	
182	2001	2002	.0324	.0000	-.0156	.0000	-.0259	.0000	CFIT Adj 06/29/06

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA	
212	42	SGP 7108 (1993)	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25	NOT OBS.
213	42	SGP 7108 (1993)	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33	NOT OBS.
214	50	JPL 4005 WEST	LAT	39 1 18.02	-1.66	-.17	39 1 16.36	.25	NOT OBS.
215	50	JPL 4005 WEST	LON	76 49 37.51	-8.06	-.54	76 49 29.45	.33	NOT OBS.
216	94	VLBI RM PIER A	LAT	39 1 18.24	.02	.06	39 1 18.26	.24	
217	94	VLBI RM PIER A	LON	76 49 27.09	.21	.52	76 49 27.30	.32	
218	95	VLBI RM PIER B	LAT	39 1 16.36	-1.66	-.17	39 1 14.70	.25	NOT OBS.
219	95	VLBI RM PIER B	LON	76 49 38.36	-8.06	-.54	76 49 30.30	.33	NOT OBS.
220	96	VLBI RM PIER C	LAT	39 1 19.45	-1.66	-.17	39 1 17.79	.25	NOT OBS.
221	96	VLBI RM PIER C	LON	76 49 37.50	-8.06	-.54	76 49 29.44	.33	NOT OBS.
222	99	7108 RM-1	LAT	39 1 18.37	-1.66	-.17	39 1 16.71	.25	NOT OBS.
223	99	7108 RM-1	LON	76 49 34.48	-8.06	-.54	76 49 26.41	.33	NOT OBS.

224	2001	MV-3 (Preliminary)	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
225	2001	MV-3 (Preliminary)	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
226	2002	MV-3 (Final)	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
227	2002	MV-3 (Final)	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
228	510	10 EL & 0 AZ	LAT	39 1 19.06	-1.66	-.17	39 1 17.40	.25 NOT OBS.
229	510	10 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
230	525	25 EL & 0 AZ	LAT	39 1 19.05	-1.66	-.17	39 1 17.39	.25 NOT OBS.
231	525	25 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
232	540	40 EL & 0 AZ	LAT	39 1 19.03	-1.66	-.17	39 1 17.37	.25 NOT OBS.
233	540	40 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
234	555	55 EL & 0 AZ	LAT	39 1 19.01	-1.66	-.17	39 1 17.35	.25 NOT OBS.
235	555	55 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
236	570	70 EL & 0 AZ	LAT	39 1 18.98	-1.66	-.17	39 1 17.32	.25 NOT OBS.
237	570	70 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
238	585	85 EL & 0 AZ	LAT	39 1 18.95	-1.66	-.17	39 1 17.29	.25 NOT OBS.
239	585	85 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
240	5100	100 EL & 0 AZ	LAT	39 1 18.91	-1.66	-.17	39 1 17.25	.25 NOT OBS.
241	5100	100 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
242	5115	115 EL & 0 AZ	LAT	39 1 18.88	-1.66	-.17	39 1 17.22	.25 NOT OBS.
243	5115	115 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
244	5130	130 EL & 0 AZ	LAT	39 1 18.85	-1.66	-.17	39 1 17.19	.25 NOT OBS.
245	5130	130 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

STATION				OBSERVED	V	N.V	ADJUSTED	SIGMA
246	5145	145 EL & 0 AZ	LAT	39 1 18.83	-1.66	-.17	39 1 17.17	.25 NOT OBS.
247	5145	145 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
248	5160	160 EL & 0 AZ	LAT	39 1 18.82	-1.66	-.17	39 1 17.16	.25 NOT OBS.
249	5160	160 EL & 0 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.49	.33 NOT OBS.
250	610	10 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
251	610	10 EL & 90 AZ	LON	76 49 35.39	-8.06	-.54	76 49 27.33	.33 NOT OBS.
252	625	25 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
253	625	25 EL & 90 AZ	LON	76 49 35.40	-8.06	-.54	76 49 27.34	.33 NOT OBS.

254	640	40 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
255	640	40 EL & 90 AZ	LON	76 49 35.43	-8.06	-.54	76 49 27.36	.33 NOT OBS.
256	655	55 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
257	655	55 EL & 90 AZ	LON	76 49 35.46	-8.06	-.54	76 49 27.39	.33 NOT OBS.
258	670	70 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
259	670	70 EL & 90 AZ	LON	76 49 35.49	-8.06	-.54	76 49 27.43	.33 NOT OBS.
260	685	85 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
261	685	85 EL & 90 AZ	LON	76 49 35.55	-8.06	-.54	76 49 27.48	.33 NOT OBS.
262	6100	100 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
263	6100	100 EL & 90 AZ	LON	76 49 35.58	-8.06	-.54	76 49 27.51	.33 NOT OBS.
264	6115	115 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
265	6115	115 EL & 90 AZ	LON	76 49 35.62	-8.06	-.54	76 49 27.55	.33 NOT OBS.
266	6130	130 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.27	.25 NOT OBS.
267	6130	130 EL & 90 AZ	LON	76 49 35.65	-8.06	-.54	76 49 27.59	.33 NOT OBS.
268	6145	145 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.28	.25 NOT OBS.
269	6145	145 EL & 90 AZ	LON	76 49 35.68	-8.06	-.54	76 49 27.62	.33 NOT OBS.
270	6160	160 EL & 90 AZ	LAT	39 1 18.93	-1.66	-.17	39 1 17.28	.25 NOT OBS.
271	6160	160 EL & 90 AZ	LON	76 49 35.70	-8.06	-.54	76 49 27.64	.33 NOT OBS.

GEODETIC LATITUDE CONSTRAINTS

STATION	CONSTRAINED	V	N.V	ADJUSTED	SIGMA
272 42	39 1 18.93304	.00000	.00000	39 1 18.93304	.00003
273 50	39 1 18.02097	.00001	.22402	39 1 18.02098	.00002
274 94	39 1 19.91830	-.00002	-.47142	39 1 19.91828	.00002
275 95	39 1 16.36196	.00001	.27035	39 1 16.36197	.00003
276 96	39 1 19.44860	-.00002	-.52800	39 1 19.44858	.00002
277 99	39 1 18.36753	.00002	.50505	39 1 18.36755	.00002
278 2001	39 1 18.93314	.00000	.00000	39 1 18.93314	.00003
279 685	39 1 18.93307	.00000	.00000	39 1 18.93307	.00003

GEODETIC LONGITUDE CONSTRAINTS

STATION	CONSTRAINED	V	N.V	ADJUSTED	SIGMA
280 42	76 49 35.55078	.00000	.00000	76 49 35.55078	.00003
281 50	76 49 37.51233	.00003	.75147	76 49 37.51236	.00002

282	94	76 49 35.36084	-.00002	-.53826	76 49 35.36082	.00003
283	95	76 49 38.36408	-.00001	-.18121	76 49 38.36407	.00003
284	96	76 49 37.49768	.00002	.47381	76 49 37.49770	.00003
285	99	76 49 34.47589	-.00002	-.50585	76 49 34.47587	.00003
286	2001	76 49 35.55082	.00000	.00000	76 49 35.55082	.00003
287	685	76 49 35.54565	.00000	.00000	76 49 35.54565	.00003

GEODETIC HEIGHT CONSTRAINTS

	STATION	CONSTRAINED	V	N.V	ADJUSTED	SIGMA
288	42	13.7450	-.0003	-.3	13.7447	.000
289	50	14.2390	.0013	1.3	14.2403	.000
290	94	13.7640	-.0011	-1.1	13.7629	.000
291	95	17.7530	-.0001	-.1	17.7529	.000
292	96	12.6560	.0003	.3	12.6563	.000
293	99	13.3550	.0000	.0	13.3550	.000
294	2001	18.0970	.0000	.0	18.0970	.001
295	685	21.9190	.0000	.0	21.9190	.001

ADJUSTED CARTESIAN COORDINATES

DX	DY	DZ	EPSILON	PSI	OMEGA	SCALE
.000	.000	.000	.000	.000	.000	.000

STATION		X	Y	Z	TRANSFORMED COORDINATES X	Y	Z
42	SGP 7108 (1993)	1130794.761	-4831233.816	3994217.044			
50	JPL 4005 WEST	1130752.939	-4831262.187	3994195.505			
94	VLBI RM PIER A	1130794.854	-4831214.162	3994240.660			
95	VLBI RM PIER B	1130740.952	-4831300.877	3994157.970			
96	VLBI RM PIER C	1130746.685	-4831233.920	3994228.710			
99	7108 RM-1	1130822.371	-4831238.319	3994203.251			
2001	MV-3 (Preliminary)	1130795.530	-4831237.107	3994219.787			
2002	MV-3 (Final)	1130795.536	-4831237.064	3994219.796			
510	10 EL & 0 AZ	1130795.115	-4831235.197	3994223.141			
525	25 EL & 0 AZ	1130795.338	-4831236.132	3994223.531			
540	40 EL & 0 AZ	1130795.559	-4831237.107	3994223.650			
555	55 EL & 0 AZ	1130795.786	-4831238.078	3994223.506			
570	70 EL & 0 AZ	1130795.994	-4831238.978	3994223.110			
585	85 EL & 0 AZ	1130796.172	-4831239.749	3994222.487			
5100	100 EL & 0 AZ	1130796.306	-4831240.337	3994221.679			
5115	115 EL & 0 AZ	1130796.387	-4831240.701	3994220.743			
5130	130 EL & 0 AZ	1130796.413	-4831240.816	3994219.745			
5145	145 EL & 0 AZ	1130796.378	-4831240.676	3994218.747			
5160	160 EL & 0 AZ	1130796.287	-4831240.289	3994217.822			
610	10 EL & 90 AZ	1130799.353	-4831236.699	3994220.189			

625	25 EL & 90 AZ	1130799.233	-4831237.494	3994220.794
640	40 EL & 90 AZ	1130798.862	-4831238.261	3994221.332
655	55 EL & 90 AZ	1130798.263	-4831238.946	3994221.765
670	70 EL & 90 AZ	1130797.479	-4831239.501	3994222.063
685	85 EL & 90 AZ	1130796.328	-4831239.971	3994222.192
6100	100 EL & 90 AZ	1130795.575	-4831240.088	3994222.184
6115	115 EL & 90 AZ	1130794.584	-4831240.079	3994222.000
6130	130 EL & 90 AZ	1130793.660	-4831239.866	3994221.664
6145	145 EL & 90 AZ	1130792.863	-4831239.459	3994221.200
6160	160 EL & 90 AZ	1130792.249	-4831238.891	3994220.640

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD DATE: 06-12-** TIME: 16:43:08 PAGE 21

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO	STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.		STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
42	2002	AZ.7654.78	1.00	.00	.00	DX	.0014	1.00	.03	-.03	.7752	22 13 2.39	22 25 1.40
		DIST. .0013	.00	1.00	.00	DY	.0013	.03	1.00	.11	-3.2477	4.3266	.0384
		V.A. 67.91	.00	.00	1.00	DZ	.0014	-.03	.11	1.00	2.7515	0 30 29.13	202 25 1.40
2001	510	AZ. 68.84	1.00	.10	.00	DX	.0013	1.00	.09	.06	-.4146	0 28 18.22	0 28 14.11
		DIST. .0012	.10	1.00	-.07	DY	.0012	.09	1.00	.15	1.9098	3.8814	3.8358
		V.A. 58.53	.00	-.07	1.00	DZ	.0012	.06	.15	1.00	3.3536	81 12 25.39	180 28 14.11
2001	525	AZ. 81.56	1.00	.34	-.21	DX	.0013	1.00	.24	.22	-.1922	0 34 9.09	0 34 6.83
		DIST. .0016	.34	1.00	-.39	DY	.0015	.24	1.00	.47	.9752	3.8734	3.5341
		V.A. 68.51	-.21	-.39	1.00	DZ	.0014	.22	.47	1.00	3.7437	65 50 23.16	180 34 6.83
2001	540	AZ. 87.60	1.00	.08	-.04	DX	.0013	1.00	.07	.05	.0294	0 32 50.41	0 32 50.44
		DIST. .0012	.08	1.00	-.12	DY	.0012	.07	1.00	.14	.0000	3.8633	2.9972
		V.A. 63.04	-.04	-.12	1.00	DZ	.0012	.05	.14	1.00	3.8632	50 52 48.94	180 32 50.44
2001	555	AZ. 106.35	1.00	.04	-.02	DX	.0012	1.00	.03	.02	.2559	0 42 25.60	0 42 29.20
		DIST. .0011	.04	1.00	-.07	DY	.0011	.03	1.00	.09	-.9711	3.8520	2.2573
		V.A. 60.08	-.02	-.07	1.00	DZ	.0011	.02	.09	1.00	3.7188	35 52 26.57	180 42 29.20
2001	570	AZ. 175.72	1.00	.03	-.02	DX	.0012	1.00	.03	.02	.4636	1 2 14.89	1 2 26.32
		DIST. .0010	.03	1.00	-.03	DY	.0011	.03	1.00	.09	-1.8716	3.8418	1.3679
		V.A. 60.90	-.02	-.03	1.00	DZ	.0011	.02	.09	1.00	3.3229	20 51 31.76	181 2 26.32
2001	585	AZ. 651.80	1.00	.04	.03	DX	.0012	1.00	.01	-.03	.6419	3 23 11.28	3 24 8.77
		DIST. .0010	.04	1.00	.02	DY	.0011	.01	1.00	.14	-2.6419	3.8317	.3866
		V.A. 62.00	.03	.02	1.00	DZ	.0011	-.03	.14	1.00	2.7000	5 47 28.68	183 24 8.77
2001	5100	AZ. 402.44	1.00	-.03	.02	DX	.0012	1.00	.00	-.01	.7754	178 16 52.08	178 16 9.38
		DIST. .0011	-.03	1.00	-.05	DY	.0011	.00	1.00	.05	-3.2305	3.8232	.6223
		V.A. 61.02	.02	-.05	1.00	DZ	.0011	-.01	.05	1.00	1.8918	9 22 .03	358 16 9.38
2001	5115	AZ. 176.60	1.00	-.05	-.03	DX	.0014	1.00	.05	.04	.8568	179 27 25.56	179 27 6.79
		DIST. .0011	-.05	1.00	.01	DY	.0011	.05	1.00	.00	-3.5943	3.8167	1.5836

		V.A. 60.33	-.03	.01	1.00	DZ	.0011	.04	.00	1.00	.9562	24 30 48.36	359 27 6.79
2001	5130	AZ. 111.26	1.00	-.03	-.04	DX	.0013	1.00	.04	.04	.8829	179 40 6.60	179 39 53.98
		DIST. .0011	-.03	1.00	.01	DY	.0011	.04	1.00	.00	-3.7095	3.8133	2.4338
		V.A. 60.40	-.04	.01	1.00	DZ	.0011	.04	.00	1.00	-.0424	39 39 33.34	359 39 53.98
2001	5145	AZ. 87.32	1.00	-.02	-.04	DX	.0013	1.00	.05	.03	.8480	179 46 27.70	179 46 18.22
		DIST. .0011	-.02	1.00	.01	DY	.0011	.05	1.00	.00	-3.5686	3.8125	3.1171
		V.A. 60.47	-.04	.01	1.00	DZ	.0011	.03	.00	1.00	-1.0396	54 50 43.38	359 46 18.22
2001	5160	AZ. 76.23	1.00	-.01	-.04	DX	.0013	1.00	.05	.03	.7565	179 49 17.23	179 49 9.88
		DIST. .0011	-.01	1.00	.01	DY	.0011	.05	1.00	.00	-3.1823	3.8156	3.5857
		V.A. 60.51	-.04	.01	1.00	DZ	.0011	.03	.00	1.00	-1.9645	70 0 37.58	359 49 9.88

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO	STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.	STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
2001	610	AZ. 89.40	1.00	.31	.05	DX .0014	1.00	-.25	-.29	3.8227	89 47 28.20	89 47 23.39
		DIST. .0014	.31	1.00	.02	DY .0014	-.25	1.00	.25	.4083	3.8654	3.8151
		V.A. 65.58	.05	.02	1.00	DZ .0014	-.29	.25	1.00	.4019	80 45 10.07	269 47 23.49
2001	625	AZ. 95.40	1.00	.31	-.02	DX .0014	1.00	-.25	-.28	3.7034	89 46 28.69	89 46 24.37
		DIST. .0014	.31	1.00	-.03	DY .0014	-.25	1.00	.24	-.3867	3.8573	3.5178
		V.A. 66.07	-.02	-.03	1.00	DZ .0014	-.28	.24	1.00	1.0070	65 46 51.64	269 46 24.46
2001	640	AZ. 90.97	1.00	.05	.03	DX .0012	1.00	-.03	-.05	3.3323	89 43 26.43	89 43 22.74
		DIST. .0012	.05	1.00	-.06	DY .0012	-.03	1.00	.15	-1.1545	3.8502	2.9815
		V.A. 61.98	.03	-.06	1.00	DZ .0012	-.05	.15	1.00	1.5450	50 44 47.52	269 43 22.81
2001	655	AZ. 109.78	1.00	-.01	.08	DX .0012	1.00	.04	.03	2.7327	89 33 7.39	89 33 4.70
		DIST. .0011	-.01	1.00	-.05	DY .0012	.04	1.00	.08	-1.8387	3.8421	2.2418
		V.A. 62.37	.08	-.05	1.00	DZ .0011	.03	.08	1.00	1.9782	35 41 41.14	269 33 4.75
2001	670	AZ. 174.43	1.00	.05	-.02	DX .0012	1.00	-.01	-.02	1.9491	89 6 34.53	89 6 34.12
		DIST. .0011	.05	1.00	-.09	DY .0011	-.01	1.00	.05	-2.3944	3.8360	1.3523
		V.A. 63.70	-.02	-.09	1.00	DZ .0011	-.02	.05	1.00	2.2765	20 38 25.49	269 6 34.16
2001	685	AZ.1928.73	1.00	.00	.00	DX .0012	1.00	.00	.00	.7981	90 58 57.19	90 59 39.79
		DIST. .0012	.00	1.00	.00	DY .0012	.00	1.00	.00	-2.8642	3.8240	.1244
		V.A. 62.74	.00	.00	1.00	DZ .0012	.00	.00	1.00	2.4047	1 51 44.17	270 59 39.80
2001	6100	AZ. 366.69	1.00	-.03	-.01	DX .0012	1.00	.00	.00	.0448	272 35 29.43	272 35 16.20
		DIST. .0011	-.03	1.00	-.01	DY .0011	.00	1.00	.05	-2.9807	3.8255	.6364
		V.A. 65.54	-.01	-.01	1.00	DZ .0011	.00	.05	1.00	2.3973	9 34 38.74	92 35 16.19
2001	6115	AZ. 145.49	1.00	-.03	-.02	DX .0012	1.00	.01	.00	-.9458	271 10 23.95	271 10 15.54
		DIST. .0011	-.03	1.00	-.07	DY .0011	.01	1.00	.04	-2.9721	3.8241	1.5986

		V.A. 65.00	-.02	-.07	1.00	DZ	.0011	.00	.04	1.00	2.2126	24 42 44.14	91 10 15.50
2001	6130	AZ. 104.56	1.00	-.13	.10	DX	.0012	1.00	.11	.09	-1.8705	270 49 11.91	270 49 4.95
		DIST. .0011	-.13	1.00	-.15	DY	.0012	.11	1.00	.19	-2.7590	3.8252	2.4502
		V.A. 62.86	.10	-.15	1.00	DZ	.0011	.09	.19	1.00	1.8766	39 50 4.93	90 49 4.89
2001	6145	AZ. 87.37	1.00	-.12	.03	DX	.0013	1.00	.09	.06	-2.6668	270 41 56.13	270 41 49.95
		DIST. .0012	-.12	1.00	-.19	DY	.0012	.09	1.00	.25	-2.3525	3.8265	3.1330
		V.A. 61.90	.03	-.19	1.00	DZ	.0012	.06	.25	1.00	1.4129	54 57 43.08	90 41 49.86
2001	6160	AZ. 76.28	1.00	-.12	.06	DX	.0016	1.00	.14	.11	-3.2813	270 38 10.86	270 38 5.21
		DIST. .0015	-.12	1.00	-.26	DY	.0012	.14	1.00	.18	-1.7838	3.8310	3.6017
		V.A. 66.48	.06	-.26	1.00	DZ	.0013	.11	.18	1.00	.8529	70 4 47.72	90 38 5.11

MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

		E Q U A T O R I A L S Y S T E M			HORIZON SYSTEM, ORIGIN AT THE STANDPOINT					
FROM	TO	ALTITUDE	AZIMUTH	DISTANCE	DN	SIGMA	DE	SIGMA	DU	SIGMA
42	2002	39 29 29.65	283 25 28.73	4.3266	.0355	.0014	.0145	.0014	4.3264	.0013
2001	510	59 46 6.67	102 14 59.17	3.8814	3.8357	.0012	.0316	.0013	.5933	.0011
2001	525	75 7 51.45	101 9 5.36	3.8734	3.5339	.0017	.0351	.0014	1.5854	.0011
2001	540	89 33 49.86	359 58 54.12	3.8633	2.9971	.0012	.0286	.0013	2.4375	.0011
2001	555	74 53 16.40	284 45 54.94	3.8520	2.2571	.0011	.0279	.0012	3.1213	.0010
2001	570	59 52 30.40	283 54 42.18	3.8418	1.3677	.0011	.0248	.0012	3.5900	.0010
2001	585	44 48 6.16	283 39 25.25	3.8317	.3860	.0012	.0228	.0012	3.8121	.0010
2001	5100	29 39 30.75	283 29 51.27	3.8232	-.6219	.0011	.0187	.0012	3.7722	.0011
2001	5115	14 30 32.00	283 24 30.13	3.8167	-1.5835	.0011	.0150	.0014	3.4727	.0011
2001	5130	0 38 14.35	283 23 14.21	3.8133	-2.4337	.0011	.0141	.0013	2.9357	.0011
2001	5145	15 49 25.05	283 22 2.81	3.8125	-3.1171	.0011	.0123	.0013	2.1952	.0011
2001	5160	30 59 19.45	283 22 17.13	3.8156	-3.5857	.0011	.0112	.0013	1.3043	.0011
2001	610	5 58 4.16	6 5 45.98	3.8654	.0139	.0017	3.8151	.0014	.6211	.0012
2001	625	15 8 .71	354 2 21.42	3.8573	.0138	.0016	3.5177	.0014	1.5824	.0012
2001	640	23 39 30.94	340 53 25.37	3.8502	.0144	.0013	2.9814	.0012	2.4362	.0011
2001	655	30 59 20.68	326 3 56.58	3.8421	.0175	.0012	2.2416	.0012	3.1203	.0011
2001	670	36 24 8.80	309 8 46.49	3.8360	.0210	.0011	1.3520	.0012	3.5897	.0011
2001	685	38 57 54.13	285 34 14.63	3.8240	-.0021	.0012	.1243	.0012	3.8220	.0012
2001	6100	38 48 20.26	270 51 38.17	3.8255	.0288	.0011	-.6358	.0012	3.7721	.0011
2001	6115	35 21 8.11	252 20 50.50	3.8241	.0327	.0011	-1.5984	.0012	3.4739	.0011
2001	6130	29 22 47.61	235 51 52.37	3.8252	.0351	.0012	-2.4501	.0012	2.9374	.0011
2001	6145	21 40 5.75	221 25 1.73	3.8265	.0382	.0013	-3.1328	.0013	2.1969	.0011
2001	6160	12 51 48.06	208 31 44.52	3.8310	.0400	.0013	-3.6015	.0016	1.3052	.0011

F.1.2 2002Survey Circle Fit Output for North Quadrant and East Quadrant

North Quadrant

Circle Radius: 3.8541134e+00

Circle Center: (3.2367440e-02, -2.5817605e-02)

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	3.8357000	0.5933000	0.0007101	0.0001156	-0.0007194
2	3.5339000	1.5854000	-0.0003020	-0.0001389	0.0003324
3	2.9971000	2.4375000	-0.0003375	-0.0002804	0.0004388
4	2.2571000	3.1213000	0.0000304	0.0000430	-0.0000527
5	1.3677000	3.5900000	-0.0001375	-0.0003724	0.0003969
6	0.3860000	3.8121000	-0.0000057	-0.0000617	0.0000619
7	-0.6219000	3.7722000	-0.0000261	0.0001517	-0.0001539
8	-1.5835000	3.4727000	-0.0001924	0.0004166	-0.0004589
9	-2.4337000	2.9357000	-0.0001756	0.0002109	-0.0002744
10	-3.1171000	2.1952000	-0.0002254	0.0001589	-0.0002758
11	-3.5857000	1.3043000	0.0006617	-0.0002433	0.0007050

Radius = 3.8541 m

DN = +0.0324 m

Du = -0.0258 m

East Quadrant

Circle Radius: 3.8541999e+00

Circle Center: (1.5555861e-02, -2.5901731e-02)

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	3.8151000	0.6211000	-0.0000371	-0.0000063	0.0000377
2	3.5177000	1.5824000	0.0003783	0.0001737	-0.0004163
3	2.9814000	2.4362000	-0.0003313	-0.0002751	0.0004306
4	2.2416000	3.1203000	0.0000748	0.0001058	-0.0001296
5	1.3520000	3.5897000	-0.0001710	-0.0004626	0.0004932
6	-0.6358000	3.7721000	-0.0001266	0.0007385	-0.0007493
7	-1.5984000	3.4739000	-0.0000756	0.0001639	-0.0001805
8	-2.4501000	2.9374000	0.0004778	-0.0005743	0.0007471
9	-3.1328000	2.1969000	-0.0001976	0.0001395	-0.0002419
10	-3.6015000	1.3052000	0.0000083	-0.0000031	0.0000089

Radius = 3.8542 m

DE = +0.0156 m

Du = -0.0259 m

F.1.3 2002 Survey HAVAGO Output for Green Target (Horizontal Circle)

```
INPUT FILE IS MV304_G1.TXT
 OUTPUT FILE IS MV304_G1.HAV



  ********************************* GGAO GREENBELT, MARYLAND ********************

 THIS ADJUSTMENT CONTAINS THE SURVEY OBSERVATIONS MADE AT THE GODDARD GEOPHYSICAL
 ASTRONOMICAL OBSERVATORY (GGAO) IN SEPTEMBER 2002.

 SURVEY OBSERVATIONS WHERE MADE TO SPECIAL TARGETS ATTACHED TO THE GGAO VLBA
 ANTENNA (MV-3) AT THE APPROXIMATE ENDS OF THE ELEVATION AXIS. THE ANTENNA WAS
 ROTATED IN THE AZIMUTH AND SET AT SELECTED AZIMUTH DIRECTIONS. THIS ADJUSTMENT
 IS FOR THE GREEN TARGET.


 FIVE SURVEY CONTROL STATIONS WHERE HELD CONSTRAINED FOR THE ADJUSTMENT. THE
 GEODETIC POSITION AND HEIGHT (ITRF2000) OF THE STATIONS WHERE OBTAINED FROM
 THE FINAL GGAO SITE HAVAGO ADJUSTMENT (GGAO03A2.DAT/GGAO03A2.OUT) ADJUSTED
 IN JUNE 2006. A PRELIMINARY GEODETIC POSITION AND HEIGHT OF THE MV3 VLBI
 ANTENNA CENTER OF ROTATION WAS HELD CONSTRAINED TO PROVIDE DATA FOR A CIRCLE
 FIT ADJUSTMENT ON THE ANTENNA SURVEY DATA. THE dn, de, AND du FROM THIS
 PRELIMINARY POSITION AND HEIGHT TO THE ACTUAL SURVEYED POSITION AND HEIGHT
 HAVE BEEN INCLUDED IN THIS ADJUSTMENT TO PROVIDE A FINAL GEODETIC POSITION
 AND HEIGHT OF THE VLBI MV3 ANTENNA CENTER OF ROTATION.

   ***MODIFIED  JUNE 2006:  ASTRO POSITION FOR STA 94 FROM HAVAGO GGAO03A2.OUT

 *



 FLAGS IN INPUT DATA:
    *  DELETED OBSERVATION
    #  DEWEIGHTED OBSERVATION
1INPUT                                                    DATE: 08-12-**  TIME: 15:08:47   PAGE    1

 STATION DATA

 STATION  GEODETIC LAT.   GEODETIC LON.    GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                    CODES
 NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON.  ELEV.     ASTR. ST. ERRORS           X             Y            Z

    42    39  1 18.93304   76 49 35.55078    13.745   .001   .001   .001              SGP 7108 (1993)        1 1 1
    42     0  0   .00       0  0   .00             10.00  15.00

    50    39  1 18.02097   76 49 37.51233    14.239   .001   .001   .001              JPL 4005 WEST          1 1 1
    50     0  0   .00       0  0   .00             10.00  15.00
```

94	39	1	19.91830	76	49	35.36084	13.764	.001	.001	.001	VLBI RM PIER A	1	1	1
94	39	1	18.24	76	49	27.09		.30	.40					
95	39	1	16.36196	76	49	38.36408	17.753	.001	.001	.001	VLBI RM PIER B	1	1	1
95	0	0	.00	0	0	.00		10.00	15.00					
96	39	1	19.44860	76	49	37.49768	12.656	.001	.001	.001	VLBI RM PIER C	1	1	1
96	0	0	.00	0	0	.00		10.00	15.00					
99	39	1	18.36753	76	49	34.47589	13.355	.001	.001	.001	7108 RM-1	1	1	1
99	0	0	.00	0	0	.00		10.00	15.00					
2001	39	1	18.93314	76	49	35.55082	18.097	.001	.001	.001	MV-3 (Preliminary)	1	1	1
2001	0	0	.00	0	0	.00		10.00	15.00					
2002	39	1	18.93314	76	49	35.55082	18.097	.000	.000	.000	MV-3 (Final)	0	0	0
2002	0	0	.00	0	0	.00		10.00	15.00					
2030	39	1	18.97090	76	49	35.52180	18.097	.000	.000	.000	GREEN TGT 030 AZI	0	0	0
2030	0	0	.00	0	0	.00		10.00	15.00					
2060	39	1	18.95460	76	49	35.50190	18.097	.000	.000	.000	GREEN TGT 060 AZI	0	0	0
2060	0	0	.00	0	0	.00		10.00	15.00					
2090	39	1	18.93330	76	49	35.49500	18.097	.000	.000	.000	GREEN TGT 090 AZI	0	0	0
2090	0	0	.00	0	0	.00		10.00	15.00					
2120	39	1	18.91180	76	49	35.50260	18.097	.000	.000	.000	GREEN TGT 120 AZI	0	0	0
2120	0	0	.00	0	0	.00		10.00	15.00					
2150	39	1	18.89640	76	49	35.52300	18.097	.000	.000	.000	GREEN TGT 150 AZI	0	0	0
2150	0	0	.00	0	0	.00		10.00	15.00					
2180	39	1	18.89100	76	49	35.55060	18.097	.000	.000	.000	GREEN TGT 180 AZI	0	0	0
2180	0	0	.00	0	0	.00		10.00	15.00					
2210	39	1	18.89700	76	49	35.57790	18.097	.000	.000	.000	GREEN TGT 210 AZI	0	0	0
2210	0	0	.00	0	0	.00		10.00	15.00					
2240	39	1	18.91290	76	49	35.59770	18.097	.000	.000	.000	GREEN TGT 240 AZI	0	0	0
2240	0	0	.00	0	0	.00		10.00	15.00					
2270	39	1	18.93440	76	49	35.60460	18.097	.000	.000	.000	GREEN TGT 270 AZI	0	0	0
2270	0	0	.00	0	0	.00		10.00	15.00					

1INPUT DATE: 08-12-** TIME: 15:08:47 PAGE 2

STATION DATA

STATION NUMBER	GEODETIC LAT. / ASTRONOMIC LAT.	GEODETIC LON. / ASTRONOMIC LON.	GEOD.HT. / ELEV.	GEOD. ST. ERRORS (M) / ASTR. ST. ERRORS	STATION NAME / X / Y / Z	CODES

```
  2300    39  1 18.95560   76 49 35.59700    18.097   .000   .000   .000              GREEN TGT 300 AZI      0 0 0
  2300     0  0   .00       0  0   .00              10.00  15.00

  2330    39  1 18.97110   76 49 35.57690    18.097   .000   .000   .000              GREEN TGT 330 AZI      0 0 0
  2330     0  0   .00       0  0   .00              10.00  15.00

  2360    39  1 18.97660   76 49 35.54900    18.097   .000   .000   .000              GREEN TGT 360 AZI      0 0 0
  2360     0  0   .00       0  0   .00              10.00  15.00
1INPUT                                                          DATE: 08-12-**  TIME: 15:08:47   PAGE    3

 DIRECTIONS

        FROM  TO  LIST    OBSERVED      MM   SEC.

    1   50   96    1     0  0   .00   1.0   1.0      JLL T2 9/12/02
    2   50 2270    1    57 59 12.75   1.0   1.0
    3   50 2300    1    57 30  7.50   1.0   1.0
    4   50 2330    1    57 20 51.25   1.0   1.0
    5   50 2360    1    57 33 51.75   1.0   1.0
    6   50   96    2     0  0   .00   1.0   1.0      JLL T3000 9/13/02
    7   50 2120    2    59 54 54.10   1.0   1.0
    8   50 2150    2    60  5 35.58   1.0   1.0
    9   50 2180    2    59 54 16.30   1.0   1.0
   10   50 2210    2    59 23 14.68   1.0   1.0
   11   50 2240    2    58 40 43.75   1.0   1.0
   12   94   99    1     0  0   .00   1.0   1.0      NNP T2000 9/12/02
   13   94 2030    1    31 33 46.75   1.0   1.0
   14   94 2060    1    30 31 56.78   1.0   1.0
   15   94 2360    1    32 52 48.80   1.0   1.0
   16   94   99    2     0  0   .00   1.0   1.0      NNP T2000 9/13/02
   17   94 2090    2    30  4 43.88   1.0   1.0
   18   94 2120    2    30 17 21.28   1.0   1.0
   19   95   99    1     0  0   .00   1.0   1.0      NNP T2000 9/12/02
   20   95 2270    1   343 23 16.25   1.0   1.0
   21   95   94    2     0  0   .00   1.0   1.0      NNP T3000 9/12/02
   22   95 2300    2     6 23  7.20   1.0   1.0
   23   95 2330    2     6 25 19.48   1.0   1.0
   24   95   94    3     0  0   .00   1.0   1.0      NNP T2000 9/13/02
   25   95 2120    3     7 48 57.50   1.0   1.0
   26   95   99    4     0  0   .00   1.0   1.0      NNP T2000 9/13/02
   27   95 2150    4   344 38  3.28   1.0   1.0
   28   95 2180    4   344 25  4.28   1.0   1.0
   29   95   96    5     0  0   .00   1.0   1.0      JLL T3000 9/13/02
   30   95 2210    5    28 14 58.75   1.0   1.0
   31   95 2240    5    27 52 14.50   1.0   1.0
   32   96   50    1     0  0   .00   1.0   1.0      JLL T2  9/12/02
   33   96 2030    1   286 45 50.00   1.0   1.0
   34   96 2270    1   288 43 53.00   1.0   1.0
   35   96 2300    1   287 55 24.50   1.0   1.0
   36   96 2330    1   287 12 30.75   1.0   1.0
```

37	96	2360	1	286	46	57.75	1.0	1.0	
38	96	50	2	0	0	.00	1.0	1.0	JLL T3000 9/13/02
39	96	2180	2	289	41	16.80	1.0	1.0	
40	96	2210	2	289	44	52.80	1.0	1.0	
41	96	2240	2	289	23	57.32	1.0	1.0	
42	99	94	1	0	0	.00	1.0	1.0	NNP T2000 9/12/02
43	99	2030	1	330	28	29.78	1.0	1.0	
44	99	2060	1	330	15	58.30	1.0	1.0	
45	99	2360	1	330	2	40.45	1.0	1.0	
46	99	94	2	0	0	.00	1.0	1.0	NNP T2000 9/13/02
47	99	2090	2	329	26	32.95	1.0	1.0	
48	99	2120	2	328	12	24.00	1.0	1.0	
49	99	2150	2	326	55	42.00	1.0	1.0	
50	99	2180	2	325	59	13.30	1.0	1.0	

1INPUT DATE: 08-12-** TIME: 15:08:47 PAGE 4

DIRECTIONS

	FROM	TO	LIST	OBSERVED	MM	SEC.
51	99	2210	2	325 38 9.10	1.0	1.0
52	99	2240	2	325 56 15.18	1.0	1.0

1INPUT DATE: 08-12-** TIME: 15:08:47 PAGE 5

GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	MM	SEC.	H.I.	H.T.	K1	K2	
53	50	2270	-1	87 30 55.00	2.0	1.0	1.500	.000	.00	.00	JLL T2 9/12/02
54	50	2300	-1	87 32 20.75	2.0	1.0	1.500	.000	.00	.00	
55	50	2330	-1	87 34 4.00	2.0	1.0	1.500	.000	.00	.00	
56	50	2360	-1	87 35 44.50	2.0	1.0	1.500	.000	.00	.00	
57	50	2120	-1	87 35 50.10	2.0	1.0	1.502	.000	.00	.00	JLL T3000 9/13/02
58	50	2150	-1	87 34 6.90	2.0	1.0	1.502	.000	.00	.00	
59	50	2180	-1	87 32 19.55	2.0	1.0	1.502	.000	.00	.00	
60	50	2210	-1	87 30 58.12	2.0	1.0	1.502	.000	.00	.00	
61	50	2240	-1	87 30 30.82	2.0	1.0	1.502	.000	.00	.00	
62	94	2030	-1	82 8 5.60	1.0	1.0	.241	.000	.00	.00	NNP T2000 9/12/02
63	94	2060	-1	82 14 50.72	1.0	1.0	.241	.000	.00	.00	
64	94	2360	-1	82 6 40.15	1.0	1.0	.241	.000	.00	.00	
65	94	2090	-1	82 23 48.90	1.0	1.0	.236	.000	.00	.00	NNP T2000 9/13/02
66	94	2120	-1	82 33 33.60	1.0	1.0	.236	.000	.00	.00	
67	95	2270	-1	89 57 22.52	1.0	1.0	.242	.000	.00	.00	NNP T3000 9/12/02
68	95	2300	-1	89 57 21.65	1.0	1.0	.242	.000	.00	.00	
69	95	2330	-1	89 57 24.05	1.0	1.0	.242	.000	.00	.00	
70	95	2120	-1	89 57 22.45	1.0	1.0	.241	.000	.00	.00	NNP T2000 9/13/02
71	95	2150	-1	89 57 21.78	1.0	1.0	.241	.000	.00	.00	
72	95	2180	-1	89 57 20.70	1.0	1.0	.241	.000	.00	.00	
73	95	2210	-1	89 57 17.12	1.0	1.0	.240	.000	.00	.00	JLL T3000 9/13/02
74	95	2240	-1	89 57 17.92	1.0	1.0	.240	.000	.00	.00	
75	96	2030	-1	84 3 3.75	1.0	1.0	.236	.000	.00	.00	JLL T2 9/12/02

76	96	2270	-1	83	51	43.00	1.0	1.0	.236	.000	.00	.00	
77	96	2300	-1	83	51	22.50	1.0	1.0	.236	.000	.00	.00	
78	96	2330	-1	83	53	52.50	1.0	1.0	.236	.000	.00	.00	
79	96	2360	-1	83	58	4.75	1.0	1.0	.236	.000	.00	.00	
80	96	2180	-1	84	4	2.92	1.0	1.0	.237	.000	.00	.00	JLL T3000 9/13/02
81	96	2210	-1	83	59	6.60	1.0	1.0	.237	.000	.00	.00	
82	96	2240	-1	83	54	34.88	1.0	1.0	.237	.000	.00	.00	
83	99	2030	-1	84	4	14.38	2.0	1.0	1.471	.000	.00	.00	NNP T2000 9/12/08
84	99	2060	-1	83	56	29.18	2.0	1.0	1.471	.000	.00	.00	
85	99	2360	-1	84	11	18.65	2.0	1.0	1.471	.000	.00	.00	
86	99	2090	-1	83	50	.88	2.0	1.0	1.465	.000	.00	.00	NNP T2000 9/13/02
87	99	2120	-1	83	47	11.85	2.0	1.0	1.465	.000	.00	.00	
88	99	2150	-1	83	49	.68	2.0	1.0	1.465	.000	.00	.00	
89	99	2180	-1	83	54	39.32	2.0	1.0	1.465	.000	.00	.00	
90	99	2210	-1	84	2	15.95	2.0	1.0	1.465	.000	.00	.00	
91	99	2240	-1	84	9	36.70	2.0	1.0	1.465	.000	.00	.00	

1INPUT DATE: 08-12-** TIME: 15:08:47 PAGE 6

ELEVATION DIFFERENCES

	FROM	TO	OBSERVED	S.E.	
92	42	99	-.388	.001	HAVAGO GGAO03A2
93	99	94	.407	.001	HAVAGO GGAO03A2
94	42	94	.019	.001	" "
95	42	96	-1.091	.001	" "
96	99	50	.882	.001	" "
97	94	96	-1.109	.001	" "
98	50	96	-1.584	.001	" "
99	95	96	-5.097	.001	" "
100	50	95	3.513	.001	" "

POSITION DIFFERENCES (METERS)

	FROM	TO	LAT.	S.E.	LON.	S.E.	HEIGHT	S.E.	
101	2001	2002	.0324	.0010	-.0156	.0010	-.0259	.0010	CFIT Adj 06/29/06

ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

	FROM	TO
102	94	42
103	94	50
104	94	95
105	94	96
106	94	99
107	94	2001
108	94	2002

```
   109   94 2030
   110   94 2060
   111   94 2090
   112   94 2120
   113   94 2150
   114   94 2180
   115   94 2210
   116   94 2240
   117   94 2270
   118   94 2300
   119   94 2330
   120   94 2360
1INPUT                                                          DATE: 08-12-**  TIME: 15:08:47   PAGE    7


 A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

                                VECTOR SUM OF

 DIRECTIONS                    1.0 MM     1.0 SEC.
 AZIMUTHS                      2.0 MM     1.3 SEC.
 RECIPROCAL VERTICAL ANGLES    7.0 MM     9.0 SEC.
 GROUPED VERTICAL ANGLES       3.0 MM     5.0 SEC.
 ABSOLUTE DISTANCES            5.0 MM     9.9 PPM
 RELATIVE DISTANCES            5.0 MM     9.9 PPM

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD         HAVAGO VERSION 90.07.18       DATE: 08-12-**  TIME: 15:08:47   PAGE    8

 JOB STATISTICS


 ELLIPSOID:  ITRF2000         A = 6378137.000   1/F = 298.2572221


 STANDARD ERROR OF UNIT WEIGHT =   .88, VARIANCE =   .77,  51 DEGREES OF FREEDOM.


   165 OBSERVATIONS                                      1 ITERATIONS
    52 DIRECTIONS                                       20 STATIONS
     0 ASTR. AZIMUTHS                                  114 UNKNOWNS
     0 REC. VERTICAL ANGLES                             13 LISTS OF DIRECTIONS
    39 GROUPED VERTICAL ANGLES                           1 REFRACTION UNKNOWNS
     0 ABSOLUTE DISTANCES                                0 SCALE UNKNOWNS
     0 RELATIVE DISTANCES
     9 ELEVATION DIFFERENCES
     1 LAT., LON., HEIGHT DIFFERENCES
     0 PLANE DISTANCES
     1 OBSERVED ASTR. LATITUDES
```

```
    1 OBSERVED ASTR. LONGITUDES
    7 CONSTRAINED GEOD. LATITUDES
    7 CONSTRAINED GEOD. LONGITUDES
    7 CONSTRAINED GEOD. HEIGHTS
   19 ASTR. POSITION DIFFERENCES

 DK/DH ASSUMED AS   -.010/1000 IF K VALUES NOT INPUT.


 SELECTED OPTIONS:

 CC  FLAG   OPTION

 31   9   ITERATIONS
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD         HAVAGO VERSION 90.07.18       DATE: 08-12-**  TIME: 15:08:47   PAGE    9

 ADJUSTED DATA: STATIONS

 STATION                                    LATITUDE        SIGMA        LONGITUDE       SIGMA      HEIGHT     SIGMA

    42              SGP 7108 (1993)         39  1 18.93304    .00003     76 49 35.55078    .00004      13.745      .001
    50              JPL 4005 WEST           39  1 18.02098    .00002     76 49 37.51234    .00003      14.240      .000
    94              VLBI RM PIER A          39  1 19.91828    .00003     76 49 35.36083    .00003      13.763      .000
    95              VLBI RM PIER B          39  1 16.36196    .00003     76 49 38.36408    .00004      17.754      .000
    96              VLBI RM PIER C          39  1 19.44859    .00002     76 49 37.49769    .00003      12.656      .000
    99              7108 RM-1               39  1 18.36754    .00003     76 49 34.47588    .00003      13.355      .000
  2001              MV-3 (Preliminary)      39  1 18.93314    .00003     76 49 35.55082    .00004      18.097      .001
  2002              MV-3 (Final)            39  1 18.93419    .00004     76 49 35.55017    .00005      18.071      .001
  2030            GREEN TGT 030 AZI         39  1 18.97093    .00004     76 49 35.52212    .00005      18.075      .001
  2060              GREEN TGT 060 AZI       39  1 18.95502    .00005     76 49 35.50229    .00005      18.075      .001
  2090              GREEN TGT 090 AZI       39  1 18.93367    .00005     76 49 35.49532    .00005      18.075      .001
  2120              GREEN TGT 120 AZI       39  1 18.91228    .00003     76 49 35.50300    .00004      18.075      .001
  2150              GREEN TGT 150 AZI       39  1 18.89685    .00003     76 49 35.52340    .00005      18.074      .001
  2180              GREEN TGT 180 AZI       39  1 18.89141    .00003     76 49 35.55096    .00005      18.074      .001
  2210              GREEN TGT 210 AZI       39  1 18.89741    .00003     76 49 35.57823    .00005      18.075      .001
  2240              GREEN TGT 240 AZI       39  1 18.91332    .00003     76 49 35.59805    .00005      18.075      .001
  2270              GREEN TGT 270 AZI       39  1 18.93476    .00004     76 49 35.60502    .00006      18.074      .001
  2300              GREEN TGT 300 AZI       39  1 18.95598    .00004     76 49 35.59729    .00006      18.075      .001
  2330              GREEN TGT 330 AZI       39  1 18.97145    .00004     76 49 35.57718    .00006      18.074      .001
  2360              GREEN TGT 360 AZI       39  1 18.97700    .00003     76 49 35.54942    .00004      18.076      .001
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD         HAVAGO VERSION 90.07.18       DATE: 08-12-**  TIME: 15:08:47   PAGE   10

 ADJUSTED DATA: DIRECTIONS

       FROM   TO  LIST   OBSERVED      V     N.V     ADJUSTED      DIST.         AZ.          V.A.

     1   50   96   1    0  0   .00   7.54   1.58    0  0   .00      44.054    0 27 35.81   92  3 39.46   JLL T2 9/12/02
     2   50 2270   1   57 59 12.75  -1.50   -.38   57 59  3.71      53.980   58 26 39.52   85 55 30.34
     3   50 2300   1   57 30  7.50  -3.38   -.86   57 29 56.58      54.482   57 57 32.39   85 57 42.62
     4   50 2330   1   57 20 51.25  -1.12   -.29   57 20 42.59      55.144   57 48 18.40   86  0 41.56
```

5	50	2360	1	57	33	51.75	.90	.24	57	33	45.11	55.799	58	1	20.92	86	3	24.21	
6	50	96	2	0	0	.00	-4.71	-.98	0	0	.00	44.054	0	27	35.81	92	3	39.46	JLL T3000 9/13/02
7	50	2120	2	59	54	54.10	1.82	.48	59	55	.64	55.736	60	22	36.45	86	3	12.67	
8	50	2150	2	60	5	35.58	3.37	.87	60	5	43.66	55.076	60	33	19.47	86	0	25.56	
9	50	2180	2	59	54	16.30	-1.06	-.27	59	54	19.95	54.418	60	21	55.76	85	57	29.31	
10	50	2210	2	59	23	14.68	-.10	-.02	59	23	19.30	53.943	59	50	55.11	85	55	18.40	
11	50	2240	2	58	40	43.75	-1.06	-.27	58	40	47.41	53.782	59	8	23.21	85	54	34.75	
12	94	99	1	0	0	.00	1.38	.34	0	0	.00	52.347	156	0	17.63	90	26	45.63	NNP T2000 9/12/02
13	94	2030	1	31	33	46.75	-2.30	-.33	31	33	43.07	29.785	187	34	.70	81	40	32.45	
14	94	2060	1	30	31	56.78	-.71	-.10	30	31	54.69	30.209	186	32	12.32	81	47	36.56	
15	94	2360	1	32	52	48.80	-1.05	-.15	32	52	46.37	29.694	188	53	4.00	81	38	58.88	
16	94	99	2	0	0	.00	1.26	.31	0	0	.00	52.347	156	0	17.63	90	26	45.63	NNP T2000 9/13/02
17	94	2090	2	30	4	43.88	.49	.07	30	4	43.11	30.838	186	5	.73	81	57	46.76	
18	94	2120	2	30	17	21.28	-3.83	-.58	30	17	16.19	31.507	186	17	33.82	82	8	7.81	
19	95	99	1	0	0	.00	-.61	-.29	0	0	.00	112.218	56	31	36.99	92	14	44.23	NNP T2000 9/12/02
20	95	2270	1	343	23	16.25	.69	.31	343	23	17.55	103.441	39	54	54.54	89	49	19.10	
21	95	94	2	0	0	.00	-1.59	-.86	0	0	.00	131.387	33	22	34.48	91	44	25.18	NNP T3000 9/12/02
22	95	2300	2	6	23	7.20	1.60	.72	6	23	10.39	104.062	39	45	44.87	89	49	21.38	
23	95	2330	2	6	25	19.48	.66	.30	6	25	21.73	104.738	39	47	56.21	89	49	27.75	
24	95	94	3	0	0	.00	1.75	.94	0	0	.00	131.387	33	22	34.48	91	44	25.18	NNP T2000 9/13/02
25	95	2120	3	7	48	57.50	-2.48	-1.12	7	48	53.27	104.510	41	11	27.75	89	49	25.41	
26	95	99	4	0	0	.00	1.29	.62	0	0	.00	112.218	56	31	36.99	92	14	44.23	NNP T2000 9/13/02
27	95	2150	4	344	38	3.28	-1.87	-.84	344	38	.12	103.828	41	9	37.11	89	49	23.03	
28	95	2180	4	344	25	4.28	.41	.18	344	25	3.40	103.266	40	56	40.39	89	49	18.42	
29	95	96	5	0	0	.00	.38	.16	0	0	.00	97.573	12	21	6.88	92	59	43.46	JLL T3000 9/13/02
30	95	2210	5	28	14	58.75	-.44	-.20	28	14	57.93	102.978	40	36	4.81	89	49	15.29	
31	95	2240	5	27	52	14.50	.09	.04	27	52	14.21	103.043	40	13	21.09	89	49	15.95	
32	96	50	1	0	0	.00	4.37	.91	0	0	.00	44.054	180	27	35.82	87	56	21.96	JLL T2 9/12/02
33	96	2030	1	286	45	50.00	-2.25	-.53	286	45	43.38	50.048	107	13	19.20	83	46	53.74	
34	96	2270	1	288	43	53.00	.62	.14	288	43	49.25	48.511	109	11	25.07	83	35	6.18	
35	96	2300	1	287	55	24.50	1.29	.30	287	55	21.42	48.477	108	22	57.24	83	34	46.29	
36	96	2330	1	287	12	30.75	.39	.09	287	12	26.77	48.787	107	40	2.59	83	37	18.71	
37	96	2360	1	286	46	57.75	-3.44	-.80	286	46	49.94	49.370	107	14	25.76	83	41	43.65	
38	96	50	2	0	0	.00	-6.58	-1.37	0	0	.00	44.054	180	27	35.82	87	56	21.96	JLL T3000 9/13/02
39	96	2180	2	289	41	16.80	.25	.06	289	41	23.63	50.176	110	8	59.45	83	47	56.15	
40	96	2210	2	289	44	52.80	2.33	.54	289	45	1.72	49.500	110	12	37.53	83	42	47.53	

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD HAVAGO VERSION 90.07.18 DATE: 08-12-** TIME: 15:08:47 PAGE 11

ADJUSTED DATA: DIRECTIONS

FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.

41	96	2240	2	289	23	57.32	2.74	.63	289	24	6.65	48.888	109	51	42.46	83	38	3.42	
42	99	94	1	0	0	.00	3.83	.94	0	0	.00	52.347	336	0	18.18	89	33	16.07	NNP T2000 9/12/02
43	99	2030	1	330	28	29.78	-4.13	-.63	330	28	21.83	31.653	306	28	40.01	81	25	31.85	
44	99	2060	1	330	15	58.30	-.76	-.11	330	15	53.72	30.986	306	16	11.90	81	14	22.14	
45	99	2360	1	330	2	40.45	-5.01	-.78	330	2	31.61	32.286	306	2	49.79	81	35	39.76	
46	99	94	2	0	0	.00	-2.98	-.73	0	0	.00	52.347	336	0	18.18	89	33	16.07	NNP T2000 9/13/02
47	99	2090	2	329	26	32.95	.53	.08	329	26	36.46	30.470	305	26	54.64	81	5	27.46	
48	99	2120	2	328	12	24.00	-.51	-.07	328	12	26.47	30.248	304	12	44.65	81	1	32.61	
49	99	2150	2	326	55	42.00	1.95	.28	326	55	46.92	30.392	302	56	5.11	81	4	12.79	
50	99	2180	2	325	59	13.30	-.33	-.05	325	59	15.94	30.856	301	59	34.13	81	12	16.24	
51	99	2210	2	325	38	9.10	3.13	.47	325	38	15.21	31.503	301	38	33.39	81	23	7.79	
52	99	2240	2	325	56	15.18	3.12	.48	325	56	21.27	32.160	301	56	39.46	81	33	46.22	

ADJUSTED DATA: GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	REF/KM	V	N.V	ADJUSTED	DIST.	AZ.	
53	50	2270	-1	85 55 28.00	.00	2.35	.30	85 55 30.34	53.980	58 26 39.52	JLL T2 9/12/02
54	50	2300	-1	85 57 46.39	.00	-3.77	-.49	85 57 42.62	54.482	57 57 32.39	
55	50	2330	-1	86 0 37.60	.00	3.96	.52	86 0 41.56	55.144	57 48 18.40	
56	50	2360	-1	86 3 23.84	.00	.37	.05	86 3 24.21	55.799	58 1 20.92	
57	50	2120	-1	86 3 15.80	.00	-3.13	-.42	86 3 12.67	55.736	60 22 36.45	JLL T3000 9/13/02
58	50	2150	-1	86 0 26.14	.00	-.58	-.08	86 0 25.56	55.076	60 33 19.47	
59	50	2180	-1	85 57 30.95	.00	-1.64	-.21	85 57 29.31	54.418	60 21 55.76	
60	50	2210	-1	85 55 19.50	.00	-1.10	-.14	85 55 18.40	53.943	59 50 55.11	
61	50	2240	-1	85 54 35.01	.00	-.26	-.03	85 54 34.75	53.782	59 8 23.21	
62	94	2030	-1	81 40 32.30	.00	.14	.02	81 40 32.45	29.785	187 34 .70	NNP T2000 9/12/02
63	94	2060	-1	81 47 40.20	.00	-3.64	-.53	81 47 36.56	30.209	186 32 12.32	
64	94	2360	-1	81 39 1.93	.00	-3.05	-.43	81 38 58.88	29.694	188 53 4.00	
65	94	2090	-1	81 57 44.24	.00	2.51	.37	81 57 46.76	30.838	186 5 .73	NNP T2000 9/13/02
66	94	2120	-1	82 8 1.60	.00	6.22	.94	82 8 7.81	31.507	186 17 33.82	
67	95	2270	-1	89 49 19.96	.00	-.86	-.39	89 49 19.10	103.441	39 54 54.54	NNP T3000 9/12/02
68	95	2300	-1	89 49 21.97	.00	-.60	-.27	89 49 21.38	104.062	39 45 44.87	
69	95	2330	-1	89 49 27.47	.00	.27	.12	89 49 27.75	104.738	39 47 56.21	
70	95	2120	-1	89 49 26.80	.00	-1.39	-.63	89 49 25.41	104.510	41 11 27.75	NNP T2000 9/13/02
71	95	2150	-1	89 49 23.01	.00	.02	.01	89 49 23.03	103.828	41 9 37.11	
72	95	2180	-1	89 49 19.32	.00	-.91	-.41	89 49 18.42	103.266	40 56 40.39	
73	95	2210	-1	89 49 16.40	.00	-1.11	-.49	89 49 15.29	102.978	40 36 4.81	JLL T3000 9/13/02
74	95	2240	-1	89 49 17.50	.00	-1.55	-.69	89 49 15.95	103.043	40 13 21.09	
75	96	2030	-1	83 46 56.35	.00	-2.61	-.61	83 46 53.74	50.048	107 13 19.20	JLL T2 9/12/02
76	96	2270	-1	83 35 5.30	.00	.88	.20	83 35 6.18	48.511	109 11 25.07	
77	96	2300	-1	83 34 44.10	.00	2.19	.50	83 34 46.29	48.477	108 22 57.24	
78	96	2330	-1	83 37 20.37	.00	-1.66	-.38	83 37 18.71	48.787	107 40 2.59	
79	96	2360	-1	83 41 44.20	.00	-.55	-.13	83 41 43.65	49.370	107 14 25.76	
80	96	2180	-1	83 47 53.86	.00	2.30	.54	83 47 56.15	50.176	110 8 59.45	JLL T3000 9/13/02
81	96	2210	-1	83 42 44.46	.00	3.07	.71	83 42 47.53	49.500	110 12 37.53	
82	96	2240	-1	83 38 .58	.00	2.84	.66	83 38 3.42	48.888	109 51 42.46	

83	99 2030	-1	81 25 16.65	.00	15.21	1.16	81 25 31.85	31.653	306 28 40.01	NNP T2000 9/12/08				
84	99 2060	-1	81 14 8.15	.00	13.99	1.04	81 14 22.14	30.986	306 16 11.90					
85	99 2360	-1	81 35 26.10	.00	13.66	1.06	81 35 39.76	32.286	306 2 49.79					
86	99 2090	-1	81 5 37.49	.00	-10.03	-.73	81 5 27.46	30.470	305 26 54.64	NNP T2000 9/13/02				
87	99 2120	-1	81 1 36.78	.00	-4.17	-.30	81 1 32.61	30.248	304 12 44.65					
88	99 2150	-1	81 4 12.00	.00	.80	.06	81 4 12.79	30.392	302 56 5.11					
89	99 2180	-1	81 12 17.74	.00	-1.50	-.11	81 12 16.24	30.856	301 59 34.13					
90	99 2210	-1	81 23 12.54	.00	-4.75	-.36	81 23 7.79	31.503	301 38 33.39					
91	99 2240	-1	81 33 46.11	.00	.10	.01	81 33 46.22	32.160	301 56 39.46					

ADJUSTED ELEVATION DIFFERENCES

	FROM	TO	MEASURED	V	N.V	ADJUSTED	E L E V A T I O N S	
92	42	99	-.3884	-.0003	-.28	-.3887	HAVAGO GGAO03A2	
93	99	94	.4070	.0003	.27	.4073	HAVAGO GGAO03A2	
94	42	94	.0186	.0000	-.01	.0186	"	"
95	42	96	-1.0906	.0000	.01	-1.0906	"	"
96	99	50	.8818	.0005	.45	.8823	"	"
97	94	96	-1.1092	.0000	.03	-1.1092	"	"
98	50	96	-1.5840	-.0002	-.16	-1.5842	"	"
99	95	96	-5.0970	-.0010	-1.02	-5.0980	"	"
100	50	95	3.5130	.0009	.86	3.5139	"	"

ADJUSTED POSITION DIFFERENCES (METERS)

	FROM	TO	LAT.	V	LON.	V	H	V	
101	2001	2002	.0324	.0000	-.0156	.0000	-.0259	.0000	CFIT Adj 06/29/06

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA	
121	42	SGP 7108 (1993)	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.27	NOT OBS.
122	42	SGP 7108 (1993)	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.36	NOT OBS.
123	50	JPL 4005 WEST	LAT	39 1 18.02	-1.69	-.17	39 1 16.34	.27	NOT OBS.
124	50	JPL 4005 WEST	LON	76 49 37.51	-8.13	-.54	76 49 29.38	.36	NOT OBS.
125	94	VLBI RM PIER A	LAT	39 1 18.24	-.01	-.03	39 1 18.23	.26	
126	94	VLBI RM PIER A	LON	76 49 27.09	.14	.35	76 49 27.23	.35	
127	95	VLBI RM PIER B	LAT	39 1 16.36	-1.69	-.17	39 1 14.67	.27	NOT OBS.
128	95	VLBI RM PIER B	LON	76 49 38.36	-8.13	-.54	76 49 30.24	.36	NOT OBS.
129	96	VLBI RM PIER C	LAT	39 1 19.45	-1.69	-.17	39 1 17.76	.27	NOT OBS.

130	96	VLBI RM PIER C	LON	76 49 37.50	-8.13	-.54	76 49 29.36	.36 NOT OBS.
131	99	7108 RM-1	LAT	39 1 18.37	-1.69	-.17	39 1 16.68	.27 NOT OBS.
132	99	7108 RM-1	LON	76 49 34.48	-8.13	-.54	76 49 26.34	.36 NOT OBS.
133	2001	MV-3 (Preliminary)	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.27 NOT OBS.
134	2001	MV-3 (Preliminary)	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.36 NOT OBS.
135	2002	MV-3 (Final)	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.27 NOT OBS.
136	2002	MV-3 (Final)	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.36 NOT OBS.
137	2030	GREEN TGT 030 AZI	LAT	39 1 18.97	-1.69	-.17	39 1 17.28	.27 NOT OBS.
138	2030	GREEN TGT 030 AZI	LON	76 49 35.52	-8.13	-.54	76 49 27.39	.36 NOT OBS.
139	2060	GREEN TGT 060 AZI	LAT	39 1 18.96	-1.69	-.17	39 1 17.27	.27 NOT OBS.
140	2060	GREEN TGT 060 AZI	LON	76 49 35.50	-8.13	-.54	76 49 27.37	.36 NOT OBS.
141	2090	GREEN TGT 090 AZI	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.27 NOT OBS.
142	2090	GREEN TGT 090 AZI	LON	76 49 35.50	-8.13	-.54	76 49 27.36	.36 NOT OBS.
143	2120	GREEN TGT 120 AZI	LAT	39 1 18.91	-1.69	-.17	39 1 17.23	.27 NOT OBS.
144	2120	GREEN TGT 120 AZI	LON	76 49 35.50	-8.13	-.54	76 49 27.37	.36 NOT OBS.
145	2150	GREEN TGT 150 AZI	LAT	39 1 18.90	-1.69	-.17	39 1 17.21	.27 NOT OBS.
146	2150	GREEN TGT 150 AZI	LON	76 49 35.52	-8.13	-.54	76 49 27.39	.36 NOT OBS.
147	2180	GREEN TGT 180 AZI	LAT	39 1 18.89	-1.69	-.17	39 1 17.21	.27 NOT OBS.
148	2180	GREEN TGT 180 AZI	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.36 NOT OBS.
149	2210	GREEN TGT 210 AZI	LAT	39 1 18.90	-1.69	-.17	39 1 17.21	.27 NOT OBS.
150	2210	GREEN TGT 210 AZI	LON	76 49 35.58	-8.13	-.54	76 49 27.45	.36 NOT OBS.
151	2240	GREEN TGT 240 AZI	LAT	39 1 18.91	-1.69	-.17	39 1 17.23	.27 NOT OBS.
152	2240	GREEN TGT 240 AZI	LON	76 49 35.60	-8.13	-.54	76 49 27.47	.36 NOT OBS.
153	2270	GREEN TGT 270 AZI	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.27 NOT OBS.
154	2270	GREEN TGT 270 AZI	LON	76 49 35.61	-8.13	-.54	76 49 27.47	.36 NOT OBS.

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD HAVAGO VERSION 90.07.18 DATE: 08-12-** TIME: 15:08:47 PAGE 15

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

STATION				OBSERVED	V	N.V	ADJUSTED	SIGMA
155	2300	GREEN TGT 300 AZI	LAT	39 1 18.96	-1.69	-.17	39 1 17.27	.27 NOT OBS.
156	2300	GREEN TGT 300 AZI	LON	76 49 35.60	-8.13	-.54	76 49 27.47	.36 NOT OBS.
157	2330	GREEN TGT 330 AZI	LAT	39 1 18.97	-1.69	-.17	39 1 17.29	.27 NOT OBS.
158	2330	GREEN TGT 330 AZI	LON	76 49 35.58	-8.13	-.54	76 49 27.45	.36 NOT OBS.
159	2360	GREEN TGT 360 AZI	LAT	39 1 18.98	-1.69	-.17	39 1 17.29	.27 NOT OBS.

160 2360 GREEN TGT 360 AZI LON 76 49 35.55 -8.13 -.54 76 49 27.42 .36 NOT OBS.

GEODETIC LATITUDE CONSTRAINTS

STATION		CONSTRAINED	V	N.V	ADJUSTED	SIGMA
161	42	39 1 18.93304	.00000	.00000	39 1 18.93304	.00003
162	50	39 1 18.02097	.00001	.39620	39 1 18.02098	.00002
163	94	39 1 19.91830	-.00002	-.47416	39 1 19.91828	.00003
164	95	39 1 16.36196	.00000	.06244	39 1 16.36196	.00003
165	96	39 1 19.44860	-.00001	-.40756	39 1 19.44859	.00002
166	99	39 1 18.36753	.00001	.42312	39 1 18.36754	.00003
167	2001	39 1 18.93314	.00000	.00000	39 1 18.93314	.00003

GEODETIC LONGITUDE CONSTRAINTS

STATION		CONSTRAINED	V	N.V	ADJUSTED	SIGMA
168	42	76 49 35.55078	.00000	.00000	76 49 35.55078	.00004
169	50	76 49 37.51233	.00001	.18063	76 49 37.51234	.00003
170	94	76 49 35.36084	-.00001	-.25440	76 49 35.36083	.00003
171	95	76 49 38.36408	.00000	.02423	76 49 38.36408	.00004
172	96	76 49 37.49768	.00001	.31947	76 49 37.49769	.00003
173	99	76 49 34.47589	-.00001	-.26996	76 49 34.47588	.00003
174	2001	76 49 35.55082	.00000	.00000	76 49 35.55082	.00004

GEODETIC HEIGHT CONSTRAINTS

STATION		CONSTRAINED	V	N.V	ADJUSTED	SIGMA
175	42	13.7450	-.0003	-.3	13.7447	.001
176	50	14.2390	.0005	.5	14.2395	.000
177	94	13.7640	-.0006	-.6	13.7634	.000
178	95	17.7530	.0006	.6	17.7536	.000
179	96	12.6560	-.0003	-.3	12.6557	.000
180	99	13.3550	.0001	.1	13.3551	.000
181	2001	18.0970	.0000	.0	18.0970	.001

ADJUSTED CARTESIAN COORDINATES

DX	DY	DZ	EPSILON	PSI	OMEGA	SCALE
.000	.000	.000	.000	.000	.000	.000

STATION		X	Y	Z	TRANSFORMED COORDINATES X	Y	Z
42	SGP 7108 (1993)	1130794.761	-4831233.816	3994217.044			
50	JPL 4005 WEST	1130752.939	-4831262.187	3994195.505			
94	VLBI RM PIER A	1130794.854	-4831214.163	3994240.661			
95	VLBI RM PIER B	1130740.952	-4831300.878	3994157.970			
96	VLBI RM PIER C	1130746.685	-4831233.919	3994228.710			
99	7108 RM-1	1130822.371	-4831238.319	3994203.251			
2001	MV-3 (Preliminary)	1130795.530	-4831237.107	3994219.787			
2002	MV-3 (Final)	1130795.536	-4831237.064	3994219.796			
2030	GREEN TGT 030 AZI	1130796.031	-4831236.219	3994220.679			
2060	GREEN TGT 060 AZI	1130796.566	-4831236.411	3994220.297			
2090	GREEN TGT 090 AZI	1130796.824	-4831236.776	3994219.786			
2120	GREEN TGT 120 AZI	1130796.738	-4831237.222	3994219.273			
2150	GREEN TGT 150 AZI	1130796.329	-4831237.625	3994218.903			
2180	GREEN TGT 180 AZI	1130795.707	-4831237.879	3994218.773			
2210	GREEN TGT 210 AZI	1130795.042	-4831237.916	3994218.917			
2240	GREEN TGT 240 AZI	1130794.508	-4831237.724	3994219.298			
2270	GREEN TGT 270 AZI	1130794.250	-4831237.356	3994219.812			
2300	GREEN TGT 300 AZI	1130794.337	-4831236.913	3994220.321			
2330	GREEN TGT 330 AZI	1130794.739	-4831236.510	3994220.690			
2360	GREEN TGT 360 AZI	1130795.365	-4831236.254	3994220.824			

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO	STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.		STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
42	2002	AZ.8178.15	1.00	.00	.00	DX	.0015	1.00	.03	-.03	.7752	22 12 55.76	22 25 1.42
		DIST. .0013	.00	1.00	.00	DY	.0014	.03	1.00	.11	-3.2476	4.3266	.0384
		V.A. 72.55	.00	.00	1.00	DZ	.0015	-.03	.11	1.00	2.7515	0 30 29.14	202 25 1.42
2001	2030	AZ. 235.46	1.00	-.11	.04	DX	.0015	1.00	-.09	-.18	.5012	30 38 32.89	30 38 27.67
		DIST. .0013	-.11	1.00	-.02	DY	.0013	-.09	1.00	.22	.8881	1.3548	1.3546
		V.A.173.13	.04	-.02	1.00	DZ	.0013	-.18	.22	1.00	.8919	90 54 38.33	210 38 27.69
2001	2060	AZ. 267.79	1.00	-.05	.06	DX	.0015	1.00	-.14	-.22	1.0361	59 58 43.64	59 58 38.45
		DIST. .0014	-.05	1.00	-.04	DY	.0015	-.14	1.00	.25	.6960	1.3485	1.3483
		V.A.194.50	.06	-.04	1.00	DZ	.0015	-.22	.25	1.00	.5105	90 55 3.42	239 58 38.48
2001	2090	AZ. 259.10	1.00	.19	.07	DX	.0015	1.00	-.14	-.22	1.2937	89 18 6.08	89 18 .93
		DIST. .0014	.19	1.00	.01	DY	.0014	-.14	1.00	.24	.3310	1.3354	1.3352
		V.A.196.51	.07	.01	1.00	DZ	.0015	-.22	.24	1.00	-.0012	90 56 46.72	269 18 .96
2001	2120	AZ. 216.10	1.00	-.03	.02	DX	.0013	1.00	.09	.03	1.2083	119 13 .78	119 12 55.69
		DIST. .0013	-.03	1.00	.00	DY	.0013	.09	1.00	.18	-.1152	1.3181	1.3179
		V.A.176.03	.02	.00	1.00	DZ	.0012	.03	.18	1.00	-.5139	90 58 34.53	299 12 55.72
2001	2150	AZ. 237.90	1.00	-.06	.00	DX	.0015	1.00	.10	.02	.7988	149 29 9.44	149 29 4.40

		DIST. .0014	-.06	1.00	.00	DY	.0013	.10	1.00	.10	-.5181		1.2994		1.2992
		V.A.196.88	.00	.00	1.00	DZ	.0013	.02	.10	1.00	-.8843	91 1	49.93	329 29	4.42
2001	2180	AZ. 233.23	1.00	-.01	-.03	DX	.0014	1.00	.06	-.02	.1773	180 9	13.19	180 9	8.18
		DIST. .0013	-.01	1.00	.01	DY	.0012	.06	1.00	.14	-.7725		1.2872		1.2870
		V.A.180.92	-.03	.01	1.00	DZ	.0012	-.02	.14	1.00	-1.0142	91 0	54.41	0 9	8.18
2001	2210	AZ. 231.88	1.00	.11	-.02	DX	.0015	1.00	.07	-.02	-.4878	210 54	2.68	210 53	57.66
		DIST. .0013	.11	1.00	-.01	DY	.0012	.07	1.00	.14	-.8089		1.2841		1.2839
		V.A.181.25	-.02	-.01	1.00	DZ	.0012	-.02	.14	1.00	-.8699	90 59	17.28	30 53	57.65
2001	2240	AZ. 215.55	1.00	.11	-.01	DX	.0015	1.00	.07	-.02	-1.0225	241 43	27.29	241 43	22.25
		DIST. .0014	.11	1.00	-.01	DY	.0012	.07	1.00	.14	-.6168		1.2903		1.2901
		V.A.180.34	-.01	-.01	1.00	DZ	.0012	-.02	.14	1.00	-.4888	90 59	20.21	61 43	22.22
2001	2270	AZ. 230.36	1.00	-.23	.01	DX	.0016	1.00	.23	.18	-1.2806	272 12	1.12	272 11	56.03
		DIST. .0017	-.23	1.00	-.04	DY	.0013	.23	1.00	.26	-.2494		1.3049		1.3047
		V.A.182.23	.01	-.04	1.00	DZ	.0013	.18	.26	1.00	.0247	90 59	32.89	92 11	55.99
2001	2300	AZ. 265.29	1.00	-.27	.03	DX	.0017	1.00	.26	.20	-1.1934	302 13	7.95	302 13	2.79
		DIST. .0015	-.27	1.00	-.04	DY	.0013	.26	1.00	.26	.1936		1.3215		1.3213
		V.A.180.01	.03	-.04	1.00	DZ	.0013	.20	.26	1.00	.5336	90 56	44.00	122 13	2.76
2001	2330	AZ. 280.90	1.00	-.01	.05	DX	.0017	1.00	.27	.21	-.7911	331 46	27.38	331 46	22.18
		DIST. .0013	-.01	1.00	-.01	DY	.0014	.27	1.00	.27	.5971		1.3411		1.3409
		V.A.177.51	.05	-.01	1.00	DZ	.0013	.21	.27	1.00	.9034	90 58	48.05	151 46	22.16

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO	STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.	STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
2001	2360	AZ. 203.22	1.00	-.02	.02	DX .0013	1.00	.01	-.05	-.1650	1 25 46.57	1 25 41.33
		DIST. .0013	-.02	1.00	-.02	DY .0012	.01	1.00	.18	.8528	1.3530	1.3528
		V.A.170.12	.02	-.02	1.00	DZ .0012	-.05	.18	1.00	1.0373	90 53 59.57	181 25 41.33

MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

		E Q U A T O R I A L S Y S T E M			HORIZON SYSTEM, ORIGIN AT THE STANDPOINT					
FROM	TO	ALTITUDE	AZIMUTH	DISTANCE	DN	SIGMA	DE	SIGMA	DU	SIGMA
42	2002	39 29 29.65	283 25 28.73	4.3266	.0355	.0015	.0145	.0015	4.3264	.0013
2001	2030	41 10 22.85	60 33 50.35	1.3548	1.1654	.0015	.6904	.0014	-.0215	.0011
2001	2060	22 14 42.76	33 53 30.40	1.3485	.6746	.0017	1.1675	.0014	-.0216	.0013
2001	2090	0 3 12.03	14 21 2.01	1.3354	.0163	.0017	1.3351	.0014	-.0221	.0013
2001	2120	22 56 52.75	354 33 15.62	1.3181	-.6433	.0013	1.1502	.0013	-.0225	.0011

2001	2150	42	53	5.50	327	1	54.86	1.2994	-1.1193	.0014	.6597	.0015	-.0234	.0012
2001	2180	51	59	36.23	282	55	34.32	1.2872	-1.2870	.0013	-.0035	.0015	-.0228	.0011
2001	2210	42	38	24.91	238	54	27.42	1.2841	-1.1017	.0013	-.6594	.0015	-.0221	.0011
2001	2240	22	15	44.08	211	5	56.22	1.2903	-.6111	.0013	-1.1362	.0015	-.0223	.0011
2001	2270	1	5	2.38	191	1	8.43	1.3049	.0501	.0014	-1.3037	.0017	-.0226	.0012
2001	2300	23	48	50.01	170	47	14.32	1.3215	.7044	.0014	-1.1178	.0017	-.0218	.0012
2001	2330	42	21	.63	142	57	23.45	1.3411	1.1814	.0014	-.6342	.0017	-.0229	.0012
2001	2360	50	3	25.49	100	56	56.22	1.3530	1.3524	.0013	.0338	.0013	-.0212	.0011

F.1.4 2002 Survey Circle Fit Output for Green Target

```
MV3 Antenna Survey 2002        Computation Date: 16 Sept 2008
Input from HAVAGO MV304_G1.HAV

Green target on end of horizontal axis

Circle Radius: 1.3194311e+00
Circle Center: (3.2118010e-02, 1.5844534e-02)
```

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	1.1654000	0.6904000	0.0005033	0.0002996	-0.0005857
2	0.6746000	1.1675000	0.0003333	0.0005975	-0.0006842
3	0.0163000	1.3351000	-0.0000010	0.0000808	-0.0000808
4	-0.6433000	1.1502000	0.0003980	-0.0006684	0.0007779
5	-1.1193000	0.6597000	-0.0001935	0.0001082	-0.0002217
6	-1.2870000	-0.0035000	-0.0001712	-0.0000025	-0.0001712
7	-1.1017000	-0.6594000	0.0001954	0.0001163	0.0002274
8	-0.6111000	-1.1362000	0.0000070	0.0000125	0.0000143
9	0.0501000	-1.3037000	-0.0000032	0.0002360	0.0002360
10	0.7044000	-1.1178000	0.0007321	-0.0012345	-0.0014352
11	1.1814000	-0.6342000	-0.0008272	0.0004678	0.0009503
12	1.3524000	0.0338000	-0.0009729	-0.0000132	0.0009730

```
    RADIUS =    1.3194 m
    DN =        +0.0321 m
    DE =        +0.0158 m
```

F.1.5 2002 Survey HAVAGO Output for Orange Target (Horizontal Circle)

```
INPUT FILE IS MV304_O1.TXT
 OUTPUT FILE IS MV304_O1.HAV



  ********************************* GGAO GREENBELT, MARYLAND ********************

 THIS ADJUSTMENT CONTAINS THE SURVEY OBSERVATIONS MADE AT THE GODDARD GEOPHYSICAL
 ASTRONOMICAL OBSERVATORY (GGAO) IN SEPTEMBER 2002.

 SURVEY OBSERVATIONS WHERE MADE TO SPECIAL TARGETS ATTACHED TO THE GGAO VLBI
 ANTENNA (MV3) AT THE APPROXIMATE ENDS OF THE ELEVATION AXIS. THE ANTENNA WAS
 ROTATED IN THE AZIMUTH AND SET AT SELECTED AZIMUTH DIRECTIONS. THIS ADJUSTMENT
 IS FOR THE ORANGE TARGET.


 FIVE SURVEY CONTROL STATIONS WHERE HELD CONSTRAINED FOR THE ADJUSTMENT. THE
 GEODETIC POSITION AND HEIGHT (ITRF2000) OF THE STATIONS WHERE OBTAINED FROM
 THE FINAL GGAO SITE HAVAGO ADJUSTMENT (GGAO03A2.DAT/GGAO03A2.OUT) ADJUSTED
 IN JUNE 2006. A PRELIMINARY GEODETIC POSITION AND HEIGHT OF THE MV3 VLBI
 ANTENNA CENTER OF ROTATION WAS HELD CONSTRAINED TO PROVIDE DATA FOR A CIRCLE
 FIT ADJUSTMENT ON THE ANTENNA SURVEY DATA. THE DN, DE, AND DU FROM THIS
 PRELIMINARY POSITION AND HEIGHT TO THE ACTUAL SURVEYED POSITION AND HEIGHT
 HAVE BEEN INCLUDED IN THIS ADJUSTMENT TO PROVIDE A FINAL GEODETIC POSITION
 AND HEIGHT OF THE VLBI MV3 ANTENNA CENTER OF ROTATION.

   ***MODIFIED  JUNE 2006:  ASTRO POSITION FOR STA 94 FROM HAVAGO GGAO03A2.OUT

 *


 FLAGS IN INPUT DATA:
    *  DELETED OBSERVATION
    #  DEWEIGHTED OBSERVATION
1INPUT                                                    DATE: 08-12-**  TIME: 09:29:51   PAGE    1

 STATION DATA

 STATION  GEODETIC LAT.   GEODETIC LON.    GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                      CODES
 NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON.  ELEV.     ASTR. ST. ERRORS           X             Y            Z

    42    39  1 18.93304   76 49 35.55078    13.745   .001   .001   .001              SGP 7108 (1993)        1 1 1
    42     0  0   .00       0  0   .00              10.00  15.00

    50    39  1 18.02097   76 49 37.51233    14.239   .001   .001   .001              JPL 4005 WEST          1 1 1
    50     0  0   .00       0  0   .00              10.00  15.00
```

94	39	1	19.91830	76	49	35.36084	13.764	.001	.001	.001	VLBI RM PIER A	1	1 1
94	39	1	18.24	76	49	27.09		.30	.40				
95	39	1	16.36196	76	49	38.36408	17.753	.001	.001	.001	VLBI RM PIER B	1	1 1
95	0	0	.00	0	0	.00		10.00	15.00				
96	39	1	19.44860	76	49	37.49768	12.656	.001	.001	.001	VLBI RM PIER C	1	1 1
96	0	0	.00	0	0	.00		10.00	15.00				
99	39	1	18.36753	76	49	34.47589	13.355	.001	.001	.001	7108 RM-1	1	1 1
99	0	0	.00	0	0	.00		10.00	15.00				
2001	39	1	18.93314	76	49	35.55082	18.097	.001	.001	.001	MV-3 (Preliminary)	1	1 1
2001	0	0	.00	0	0	.00		10.00	15.00				
2002	39	1	18.93314	76	49	35.55082	18.097	.000	.000	.000	MV-3 (Final)	0	0 0
2002	0	0	.00	0	0	.00		10.00	15.00				
1030	39	1	18.97090	76	49	35.52180	18.097	.000	.000	.000	ORANGE TGT 030 AZI	0	0 0
1030	0	0	.00	0	0	.00		10.00	15.00				
1060	39	1	18.95460	76	49	35.50190	18.097	.000	.000	.000	ORANGE TGT 060 AZI	0	0 0
1060	0	0	.00	0	0	.00		10.00	15.00				
1090	39	1	18.93330	76	49	35.49500	18.097	.000	.000	.000	ORANGE TGT 090 AZI	0	0 0
1090	0	0	.00	0	0	.00		10.00	15.00				
1120	39	1	18.91180	76	49	35.50260	18.097	.000	.000	.000	ORANGE TGT 120 AZI	0	0 0
1120	0	0	.00	0	0	.00		10.00	15.00				
1150	39	1	18.89640	76	49	35.52300	18.097	.000	.000	.000	ORANGE TGT 150 AZI	0	0 0
1150	0	0	.00	0	0	.00		10.00	15.00				
1180	39	1	18.89100	76	49	35.55060	18.097	.000	.000	.000	ORANGE TGT 180 AZI	0	0 0
1180	0	0	.00	0	0	.00		10.00	15.00				
1210	39	1	18.89700	76	49	35.57790	18.097	.000	.000	.000	ORANGE TGT 210 AZI	0	0 0
1210	0	0	.00	0	0	.00		10.00	15.00				
1240	39	1	18.91290	76	49	35.59770	18.097	.000	.000	.000	ORANGE TGT 240 AZI	0	0 0
1240	0	0	.00	0	0	.00		10.00	15.00				
1270	39	1	18.93440	76	49	35.60460	18.097	.000	.000	.000	ORANGE TGT 270 AZI	0	0 0
1270	0	0	.00	0	0	.00		10.00	15.00				

1INPUT DATE: 08-12-** TIME: 09:29:51 PAGE 2

STATION DATA

STATION NUMBER	GEODETIC LAT. / ASTRONOMIC LAT.	GEODETIC LON. / ASTRONOMIC LON.	GEOD.HT. / ELEV.	GEOD. ST. ERRORS (M) / ASTR. ST. ERRORS	STATION NAME / X / Y / Z	CODES

```
  1300    39  1 18.95560   76 49 35.59700    18.097   .000   .000   .000              ORANGE TGT 300 AZI     0 0 0
  1300     0  0   .00       0  0   .00              10.00  15.00

  1330    39  1 18.97110   76 49 35.57690    18.097   .000   .000   .000              ORANGE TGT 330 AZI     0 0 0
  1330     0  0   .00       0  0   .00              10.00  15.00

  1360    39  1 18.97660   76 49 35.54900    18.097   .000   .000   .000              ORANGE TGT 360 AZI     0 0 0
  1360     0  0   .00       0  0   .00              10.00  15.00
1INPUT                                                          DATE: 08-12-**  TIME: 09:29:51   PAGE    3
```

DIRECTIONS

	FROM	TO	LIST	OBSERVED	MM	SEC.	
1	50	96	1	0 0 .00	1.0	1.0	JLL T2 9/12/02
2	50	1120	1	59 58 49.00	1.0	1.0	
3	50	1150	1	60 10 18.25	1.0	1.0	
4	50	1180	1	59 58 10.50	1.0	1.0	
5	50	1210	1	59 25 19.50	1.0	1.0	
6	50	1240	1	58 40 35.75	1.0	1.0	
7	50	96	2	0 0 .00	1.0	1.0	JLL T3000 9/13/02
8	50	1270	2	57 56 32.18	1.0	1.0	
9	50	1300	2	57 25 39.02	1.0	1.0	
10	50	1330	2	57 16 16.52	1.0	1.0	
11	50	1360	2	57 30 6.35	1.0	1.0	
12	94	99	1	0 0 .00	1.0	1.0	NNP T2000 9/12/02
13	94	1090	1	29 56 44.28	1.0	1.0	
14	94	1120	1	30 10 8.82	1.0	1.0	
15	94	99	2	0 0 .00	1.0	1.0	NNP T2000 9/13/02
16	94	1360	2	32 53 43.02	1.0	1.0	
17	94	1030	2	31 30 20.75	1.0	1.0	
18	94	1060	2	30 25 2.68	1.0	1.0	
19	95	99	1	0 0 .00	1.0	1.0	NNP T2000 9/12/02
20	95	1090	1	344 32 .50	1.0	1.0	
21	95	94	2	0 0 .00	1.0	1.0	NNP T3000 9/12/02
22	95	1120	2	7 51 15.72	1.0	1.0	
23	95	1150	2	7 49 23.68	1.0	1.0	
24	95	1210	2	7 13 53.68	1.0	1.0	
25	95	1270	2	6 30 28.12	1.0	1.0	
26	95	1300	2	6 20 47.35	1.0	1.0	
27	95	99	3	0 0 .00	1.0	1.0	NNP T3000 9/12/02
28	95	1180	3	344 26 34.22	1.0	1.0	
29	95	1240	3	343 40 53.58	1.0	1.0	
30	95	1330	3	343 14 15.22	1.0	1.0	
31	96	50	1	0 0 .00	1.0	1.0	JLL T2 9/12/02
32	96	1180	1	289 46 10.50	1.0	1.0	
33	96	1210	1	289 49 56.50	1.0	1.0	
34	96	1240	1	289 27 52.25	1.0	1.0	
35	96	50	2	0 0 .00	1.0	1.0	JLL T3000 9/13/02
36	96	1030	2	286 40 57.15	1.0	1.0	

37	96	1270	2	288	45	19.02	1.0	1.0	
38	96	1300	2	287	53	53.05	1.0	1.0	
39	96	1330	2	287	8	34.55	1.0	1.0	
40	96	1360	2	286	42	3.60	1.0	1.0	
41	99	94	1	0	0	.00	1.0	1.0	NNP T2000 9/12/02
42	99	1090	1	329	31	21.43	1.0	1.0	
43	99	1120	1	328	12	56.68	1.0	1.0	
44	99	1150	1	326	52	16.92	1.0	1.0	
45	99	1180	1	325	52	9.25	1.0	1.0	
46	99	1210	1	325	30	11.28	1.0	1.0	
47	99	1240	1	325	49	33.48	1.0	1.0	
48	99	94	2	0	0	.00	1.0	1.0	NNP T2000 9/13/02
49	99	1030	2	330	36	19.40	1.0	1.0	
50	99	1060	2	330	23	18.28	1.0	1.0	

1INPUT DATE: 08-12-** TIME: 09:29:51 PAGE 4

DIRECTIONS

	FROM	TO	LIST	OBSERVED	MM	SEC.
51	99	1360	2	330 8 55.72	1.0	1.0

1INPUT DATE: 08-12-** TIME: 09:29:51 PAGE 5

GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	MM	SEC.	H.I.	H.T.	K1	K2	
52	50	1120	-1	87 35 48.75	2.0	1.0	1.500	.000	.00	.00	JLL T2 9/12/02
53	50	1150	-1	87 33 55.50	2.0	1.0	1.500	.000	.00	.00	
54	50	1180	-1	87 32 .50	2.0	1.0	1.500	.000	.00	.00	
55	50	1210	-1	87 30 41.00	2.0	1.0	1.500	.000	.00	.00	
56	50	1240	-1	87 30 13.50	2.0	1.0	1.500	.000	.00	.00	
57	50	1270	-1	87 31 .00	2.0	1.0	1.502	.000	.00	.00	JLL T3000 9/13/02
58	50	1300	-1	87 32 28.80	2.0	1.0	1.502	.000	.00	.00	
59	50	1330	-1	87 34 20.40	2.0	1.0	1.502	.000	.00	.00	
60	50	1360	-1	87 36 7.70	2.0	1.0	1.502	.000	.00	.00	
61	94	1090	-1	82 24 27.45	1.0	1.0	.241	.000	.00	.00	NNP T2000 9/12/02
62	94	1120	-1	82 34 38.95	1.0	1.0	.241	.000	.00	.00	
63	94	1360	-1	82 5 9.00	1.0	1.0	.236	.000	.00	.00	NNP T2000 9/13/02
64	94	1030	-1	82 6 37.48	1.0	1.0	.236	.000	.00	.00	
65	94	1060	-1	82 13 40.82	1.0	1.0	.236	.000	.00	.00	
66	95	1090	-1	89 57 23.95	1.0	1.0	.242	.000	.00	.00	NNP T3000 9/12/02
67	95	1120	-1	89 57 25.92	1.0	1.0	.242	.000	.00	.00	
68	95	1150	-1	89 57 25.42	1.0	1.0	.242	.000	.00	.00	
69	95	1180	-1	89 57 22.38	1.0	1.0	.242	.000	.00	.00	
70	95	1210	-1	89 57 22.08	1.0	1.0	.242	.000	.00	.00	
71	95	1240	-1	89 57 19.28	1.0	1.0	.242	.000	.00	.00	
72	95	1270	-1	89 57 21.32	1.0	1.0	.241	.000	.00	.00	NNP T2000 9/13/02
73	95	1300	-1	89 57 22.75	1.0	1.0	.241	.000	.00	.00	
74	95	1330	-1	89 57 22.38	1.0	1.0	.241	.000	.00	.00	
75	96	1180	-1	84 4 13.50	1.0	1.0	.236	.000	.00	.00	JLL T2 9/12/02

76	96	1210	-1	83	59	3.50	1.0	1.0	.236	.000	.00	.00	
77	96	1240	-1	83	54	7.50	1.0	1.0	.236	.000	.00	.00	
78	96	1030	-1	84	3	18.62	1.0	1.0	.237	.000	.00	.00	JLL T2 9/13/02
79	96	1270	-1	83	51	19.95	1.0	1.0	.237	.000	.00	.00	
80	96	1300	-1	83	51	.60	1.0	1.0	.237	.000	.00	.00	
81	96	1330	-1	83	53	33.58	1.0	1.0	.237	.000	.00	.00	
82	96	1360	-1	83	58	6.40	1.0	1.0	.237	.000	.00	.00	
83	99	1090	-1	83	49	37.55	2.0	1.0	1.471	.000	.00	.00	NNP T2000 9/12/02
84	99	1120	-1	83	46	49.75	2.0	1.0	1.471	.000	.00	.00	
85	99	1150	-1	83	48	33.98	2.0	1.0	1.471	.000	.00	.00	
86	99	1180	-1	83	54	38.12	2.0	1.0	1.471	.000	.00	.00	
87	99	1210	-1	84	2	36.10	2.0	1.0	1.471	.000	.00	.00	
88	99	1240	-1	84	10	26.12	2.0	1.0	1.471	.000	.00	.00	
89	99	1360	-1	84	11	32.52	2.0	1.0	1.465	.000	.00	.00	NNP T2000 9/13/02
90	99	1060	-1	83	55	53.95	2.0	1.0	1.465	.000	.00	.00	
91	99	1030	-1	84	4	5.40	2.0	1.0	1.465	.000	.00	.00	

1INPUT DATE: 08-12-** TIME: 09:29:51 PAGE 6

ELEVATION DIFFERENCES

	FROM	TO	OBSERVED	S.E.	
92	42	99	-.388	.001	HAVAGO GGAO03A2
93	99	94	.407	.001	HAVAGO GGAO03A2
94	42	94	.019	.001	" "
95	42	96	-1.091	.001	" "
96	99	50	.882	.001	" "
97	94	96	-1.109	.001	" "
98	50	96	-1.584	.001	" "
99	95	96	-5.097	.001	" "
100	50	95	3.513	.001	" "

POSITION DIFFERENCES (METERS)

	FROM	TO	LAT.	S.E.	LON.	S.E.	HEIGHT	S.E.	
101	2001	2002	.0324	.0010	-.0156	.0010	-.0259	.0010	CFIT Adj 06/29/06

ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

	FROM	TO
102	94	42
103	94	50
104	94	95
105	94	96
106	94	99
107	94	2001
108	94	2002

```
   109   94 1030
   110   94 1060
   111   94 1090
   112   94 1120
   113   94 1150
   114   94 1180
   115   94 1210
   116   94 1240
   117   94 1270
   118   94 1300
   119   94 1330
   120   94 1360
1INPUT                                                    DATE: 08-12-**  TIME: 09:29:51   PAGE    7


 A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

                                VECTOR SUM OF

 DIRECTIONS                   1.0 MM     1.0 SEC.
 AZIMUTHS                     2.0 MM     1.3 SEC.
 RECIPROCAL VERTICAL ANGLES   7.0 MM     9.0 SEC.
 GROUPED VERTICAL ANGLES      3.0 MM     5.0 SEC.
 ABSOLUTE DISTANCES           5.0 MM     9.9 PPM
 RELATIVE DISTANCES           5.0 MM     9.9 PPM

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD         HAVAGO VERSION 90.07.18       DATE: 08-12-**  TIME: 09:29:51   PAGE    8

 JOB STATISTICS


 ELLIPSOID:  ITRF2000         A = 6378137.000   1/F = 298.2572221


 STANDARD ERROR OF UNIT WEIGHT =   .72, VARIANCE =   .52,  53 DEGREES OF FREEDOM.


   165 OBSERVATIONS                                      1 ITERATIONS
    51 DIRECTIONS                                       20 STATIONS
     0 ASTR. AZIMUTHS                                  112 UNKNOWNS
     0 REC. VERTICAL ANGLES                             11 LISTS OF DIRECTIONS
    40 GROUPED VERTICAL ANGLES                           1 REFRACTION UNKNOWNS
     0 ABSOLUTE DISTANCES                                0 SCALE UNKNOWNS
     0 RELATIVE DISTANCES
     9 ELEVATION DIFFERENCES
     1 LAT., LON., HEIGHT DIFFERENCES
     0 PLANE DISTANCES
     1 OBSERVED ASTR. LATITUDES
```

```
    1 OBSERVED ASTR. LONGITUDES
    7 CONSTRAINED GEOD. LATITUDES
    7 CONSTRAINED GEOD. LONGITUDES
    7 CONSTRAINED GEOD. HEIGHTS
   19 ASTR. POSITION DIFFERENCES

 DK/DH ASSUMED AS   -.010/1000 IF K VALUES NOT INPUT.


 SELECTED OPTIONS:

 CC  FLAG   OPTION

 31   9   ITERATIONS
```


ADJUSTED DATA: STATIONS

STATION		LATITUDE	SIGMA	LONGITUDE	SIGMA	HEIGHT	SIGMA
42	SGP 7108 (1993)	39 1 18.93304	.00002	76 49 35.55078	.00003	13.745	.000
50	JPL 4005 WEST	39 1 18.02097	.00002	76 49 37.51233	.00003	14.240	.000
94	VLBI RM PIER A	39 1 19.91829	.00002	76 49 35.36084	.00003	13.763	.000
95	VLBI RM PIER B	39 1 16.36196	.00002	76 49 38.36408	.00003	17.754	.000
96	VLBI RM PIER C	39 1 19.44860	.00002	76 49 37.49768	.00002	12.656	.000
99	7108 RM-1	39 1 18.36754	.00002	76 49 34.47588	.00003	13.355	.000
2001	MV-3 (Preliminary)	39 1 18.93314	.00002	76 49 35.55082	.00003	18.097	.001
2002	MV-3 (Final)	39 1 18.93419	.00003	76 49 35.55017	.00004	18.071	.001
1030	ORANGE TGT 030 AZI	39 1 18.97294	.00003	76 49 35.52057	.00004	18.074	.001
1060	ORANGE TGT 060 AZI	39 1 18.95614	.00004	76 49 35.49964	.00004	18.074	.001
1090	ORANGE TGT 090 AZI	39 1 18.93364	.00003	76 49 35.49233	.00003	18.074	.001
1120	ORANGE TGT 120 AZI	39 1 18.91108	.00003	76 49 35.50044	.00003	18.074	.001
1150	ORANGE TGT 150 AZI	39 1 18.89482	.00003	76 49 35.52175	.00004	18.074	.001
1180	ORANGE TGT 180 AZI	39 1 18.88904	.00003	76 49 35.55109	.00004	18.074	.001
1210	ORANGE TGT 210 AZI	39 1 18.89543	.00002	76 49 35.57986	.00004	18.074	.001
1240	ORANGE TGT 240 AZI	39 1 18.91219	.00003	76 49 35.60065	.00004	18.076	.001
1270	ORANGE TGT 270 AZI	39 1 18.93486	.00003	76 49 35.60797	.00005	18.074	.001
1300	ORANGE TGT 300 AZI	39 1 18.95735	.00003	76 49 35.59978	.00005	18.074	.001
1330	ORANGE TGT 330 AZI	39 1 18.97360	.00003	76 49 35.57830	.00005	18.074	.001
1360	ORANGE TGT 360 AZI	39 1 18.97930	.00003	76 49 35.54930	.00003	18.074	.001

ADJUSTED DATA: DIRECTIONS

	FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.	
1	50	96	1	0 0 .00	-1.53	-.32	0 0 .00	44.055	0 27 37.19	92 3 39.03	JLL T2 9/12/02
2	50	1120	1	59 58 49.00	.08	.02	59 58 50.62	55.771	60 26 27.81	86 3 24.09	
3	50	1150	1	60 10 18.25	-1.85	-.48	60 10 17.94	55.080	60 37 55.13	86 0 26.11	
4	50	1180	1	59 58 10.50	.41	.10	59 58 12.44	54.380	60 25 49.63	85 57 19.42	

5	50	1210	1	59 25 19.50	3.29	.83	59 25 24.33	53.879	59 53 1.52	85 55 3.55							
6	50	1240	1	58 40 35.75	-.83	-.21	58 40 36.45	53.710	59 8 13.64	85 54 12.19							
7	50	96	2	0 0 .00	1.72	.36	0 0 .00	44.055	0 27 37.19	92 3 39.03	JLL T3000 9/13/02						
8	50	1270	2	57 56 32.18	-1.74	-.44	57 56 28.72	53.922	58 24 5.91	85 55 17.42							
9	50	1300	2	57 25 39.02	.20	.05	57 25 37.50	54.454	57 53 14.69	85 57 40.52							
10	50	1330	2	57 16 16.52	.54	.14	57 16 15.33	55.156	57 43 52.53	86 0 44.83							
11	50	1360	2	57 30 6.35	-.18	-.05	57 30 4.45	55.839	57 57 41.64	86 3 41.34							
12	94	99	1	0 0 .00	2.57	.63	0 0 .00	52.348	156 0 17.26	90 26 46.89	NNP T2000 9/12/02						
13	94	1090	1	29 56 44.28	-3.43	-.51	29 56 38.28	30.832	185 56 55.54	81 57 44.65							
14	94	1120	1	30 10 8.82	-3.54	-.53	30 10 2.71	31.537	186 10 19.97	82 8 39.07							
15	94	99	2	0 0 .00	.22	.05	0 0 .00	52.348	156 0 17.26	90 26 46.89	NNP T2000 9/13/02						
16	94	1360	2	32 53 43.02	-.19	-.03	32 53 42.61	29.624	188 53 59.87	81 38 .35							
17	94	1030	2	31 30 20.75	-.82	-.12	31 30 19.71	29.719	187 30 36.97	81 39 35.83							
18	94	1060	2	30 25 2.68	.36	.05	30 25 2.82	30.167	186 25 20.08	81 47 3.84							
19	95	99	1	0 0 .00	.78	.37	0 0 .00	112.218	56 31 37.05	92 14 44.84	NNP T2000 9/12/02						
20	95	1090	1	344 32 .50	-.86	-.39	344 31 58.86	105.175	41 3 35.91	89 49 29.86							
21	95	94	2	0 0 .00	.78	.42	0 0 .00	131.387	33 22 34.07	91 44 25.19	NNP T3000 9/12/02						
22	95	1120	2	7 51 15.72	-1.22	-.55	7 51 13.72	104.522	41 13 47.80	89 49 26.74							
23	95	1150	2	7 49 23.68	1.17	.53	7 49 24.07	103.807	41 11 58.14	89 49 22.61							
24	95	1210	2	7 13 53.68	-1.66	-.74	7 13 51.24	102.906	40 36 25.31	89 49 16.23							
25	95	1270	2	6 30 28.12	.84	.38	6 30 28.18	103.398	39 53 2.26	89 49 20.41							
26	95	1300	2	6 20 47.35	-.25	-.11	6 20 46.32	104.057	39 43 20.39	89 49 24.15							
27	95	99	3	0 0 .00	-.01	.00	0 0 .00	112.218	56 31 37.05	92 14 44.84	NNP T3000 9/12/02						
28	95	1180	3	344 26 34.22	.20	.09	344 26 34.43	103.209	40 58 11.48	89 49 18.25							
29	95	1240	3	343 40 53.58	.14	.06	343 40 53.73	102.976	40 12 30.77	89 49 13.94							
30	95	1330	3	343 14 15.22	-.32	-.14	343 14 14.91	104.772	39 45 51.96	89 49 27.89							
31	96	50	1	0 0 .00	-2.29	-.48	0 0 .00	44.055	180 27 37.20	87 56 22.40	JLL T2 9/12/02						
32	96	1180	1	289 46 10.50	-1.52	-.36	289 46 11.27	50.198	110 13 48.47	83 48 6.67							
33	96	1210	1	289 49 56.50	1.16	.27	289 49 59.95	49.484	110 17 37.15	83 42 43.55							
34	96	1240	1	289 27 52.25	2.29	.53	289 27 56.83	48.841	109 55 34.03	83 37 38.35							
35	96	50	2	0 0 .00	1.90	.40	0 0 .00	44.055	180 27 37.20	87 56 22.40	JLL T3000 9/13/02						
36	96	1030	2	286 40 57.15	-1.61	-.38	286 40 53.64	50.065	107 8 30.84	83 47 7.47							
37	96	1270	2	288 45 19.02	.66	.15	288 45 17.78	48.443	109 12 54.98	83 34 37.38							
38	96	1300	2	287 53 53.05	-.01	.00	287 53 51.14	48.407	108 21 28.34	83 34 19.13							
39	96	1330	2	287 8 34.55	-.20	-.04	287 8 32.45	48.741	107 36 9.66	83 36 57.27							
40	96	1360	2	286 42 3.60	-.31	-.07	286 42 1.39	49.351	107 9 38.59	83 41 43.17							
41	99	94	1	0 0 .00	.06	.02	0 0 .00	52.348	336 0 17.82	89 33 14.81	NNP T2000 9/12/02						

ADJUSTED DATA: DIRECTIONS

FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.

42	99	1090	1	329 31 21.43	-2.47	-.36	329 31 18.89		30.412	305 31 36.71	81 4 27.43				
43	99	1120	1	328 12 56.68	-1.69	-.24	328 12 54.93		30.177	304 13 12.75	81 0 17.95				
44	99	1150	1	326 52 16.92	-1.06	-.15	326 52 15.79		30.325	302 52 33.61	81 2 58.59				
45	99	1180	1	325 52 9.25	-1.91	-.28	325 52 7.28		30.820	301 52 25.09	81 11 37.77				
46	99	1210	1	325 30 11.28	3.61	.55	325 30 14.83		31.504	301 30 32.64	81 23 11.34				
47	99	1240	1	325 49 33.48	2.77	.43	325 49 36.18		32.194	301 49 54.00	81 34 11.61				
48	99	94	2	0 0 .00	1.16	.29	0 0 .00		52.348	336 0 17.82	89 33 14.81	NNP T2000 9/13/02			
49	99	1030	2	330 36 19.40	-2.60	-.39	330 36 15.64		31.660	306 36 33.46	81 25 45.51				
50	99	1060	2	330 23 18.28	.38	.06	330 23 17.50		30.955	306 23 35.31	81 13 56.34				
51	99	1360	2	330 8 55.72	-.80	-.12	330 8 53.76		32.325	306 9 11.57	81 36 26.41				

ADJUSTED DATA: GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	REF/KM	V	N.V	ADJUSTED	DIST.	AZ.	
52	50	1120	-1	86 3 25.35	.00	-1.26	-.17	86 3 24.09	55.771	60 26 27.81	JLL T2 9/12/02
53	50	1150	-1	86 0 22.65	.00	3.46	.46	86 0 26.11	55.080	60 37 55.13	
54	50	1180	-1	85 57 15.47	.00	3.95	.52	85 57 19.42	54.380	60 25 49.63	
55	50	1210	-1	85 55 3.19	.00	.36	.05	85 55 3.55	53.879	59 53 1.52	
56	50	1240	-1	85 54 17.76	.00	-5.57	-.72	85 54 12.19	53.710	59 8 13.64	
57	50	1270	-1	85 55 19.11	.00	-1.68	-.22	85 55 17.42	53.922	58 24 5.91	JLL T3000 9/13/02
58	50	1300	-1	85 57 43.92	.00	-3.40	-.44	85 57 40.52	54.454	57 53 14.69	
59	50	1330	-1	86 0 47.81	.00	-2.99	-.40	86 0 44.83	55.156	57 43 52.53	
60	50	1360	-1	86 3 43.60	.00	-2.26	-.30	86 3 41.34	55.839	57 57 41.64	
61	94	1090	-1	81 57 49.27	.00	-4.62	-.68	81 57 44.65	30.832	185 56 55.54	NNP T2000 9/12/02
62	94	1120	-1	82 8 35.91	.00	3.15	.48	82 8 39.07	31.537	186 10 19.97	
63	94	1360	-1	81 38 1.45	.00	-1.09	-.15	81 38 .35	29.624	188 53 59.87	NNP T2000 9/13/02
64	94	1030	-1	81 39 35.01	.00	.81	.12	81 39 35.83	29.719	187 30 36.97	
65	94	1060	-1	81 47 2.01	.00	1.83	.26	81 47 3.84	30.167	186 25 20.08	
66	95	1090	-1	89 49 29.35	.00	.52	.23	89 49 29.86	105.175	41 3 35.91	NNP T3000 9/12/02
67	95	1120	-1	89 49 28.36	.00	-1.61	-.73	89 49 26.74	104.522	41 13 47.80	
68	95	1150	-1	89 49 24.57	.00	-1.96	-.88	89 49 22.61	103.807	41 11 58.14	
69	95	1180	-1	89 49 18.74	.00	-.49	-.22	89 49 18.25	103.209	40 58 11.48	
70	95	1210	-1	89 49 17.02	.00	-.78	-.35	89 49 16.23	102.906	40 36 25.31	
71	95	1240	-1	89 49 14.54	.00	-.61	-.27	89 49 13.94	102.976	40 12 30.77	
72	95	1270	-1	89 49 20.56	.00	-.15	-.07	89 49 20.41	103.398	39 53 2.26	NNP T2000 9/13/02
73	95	1300	-1	89 49 25.03	.00	-.88	-.40	89 49 24.15	104.057	39 43 20.39	
74	95	1330	-1	89 49 27.92	.00	-.04	-.02	89 49 27.89	104.772	39 45 51.96	
75	96	1180	-1	83 48 8.95	.00	-2.27	-.54	83 48 6.67	50.198	110 13 48.47	JLL T2 9/12/02
76	96	1210	-1	83 42 45.20	.00	-1.65	-.38	83 42 43.55	49.484	110 17 37.15	
77	96	1240	-1	83 37 36.46	.00	1.89	.43	83 37 38.35	48.841	109 55 34.03	
78	96	1030	-1	83 47 7.43	.00	.03	.01	83 47 7.47	50.065	107 8 30.84	JLL T2 9/13/02
79	96	1270	-1	83 34 36.63	.00	.75	.17	83 34 37.38	48.443	109 12 54.98	
80	96	1300	-1	83 34 16.53	.00	2.60	.59	83 34 19.13	48.407	108 21 28.34	
81	96	1330	-1	83 36 56.32	.00	.95	.22	83 36 57.27	48.741	107 36 9.66	
82	96	1360	-1	83 41 41.32	.00	1.85	.43	83 41 43.17	49.351	107 9 38.59	
83	99	1090	-1	81 4 14.72	.00	12.70	.93	81 4 27.43	30.412	305 31 36.71	NNP T2000 9/12/02
84	99	1120	-1	81 0 10.48	.00	7.47	.54	81 0 17.95	30.177	304 13 12.75	

85	99	1150	-1	81 2 43.09	.00	15.50	1.13	81 2 58.59	30.325	302 52 33.61			
86	99	1180	-1	81 11 25.23	.00	12.54	.93	81 11 37.77	30.820	301 52 25.09			
87	99	1210	-1	81 22 53.72	.00	17.62	1.33	81 23 11.34	31.504	301 30 32.64			
88	99	1240	-1	81 34 6.99	.00	4.62	.36	81 34 11.61	32.194	301 49 54.00			
89	99	1360	-1	81 36 29.39	.00	-2.98	-.23	81 36 26.41	32.325	306 9 11.57	NNP T2000 9/13/02		
90	99	1060	-1	81 14 3.36	.00	-7.03	-.52	81 13 56.34	30.955	306 23 35.31			
91	99	1030	-1	81 25 48.71	.00	-3.20	-.24	81 25 45.51	31.660	306 36 33.46			

ADJUSTED ELEVATION DIFFERENCES

FROM	TO	MEASURED	V	N.V	ADJUSTED	E L E V A T I O N S	
92	42	99	-.3884	-.0005	-.53	-.3889	HAVAGO GGAO03A2
93	99	94	.4070	.0006	.59	.4076	HAVAGO GGAO03A2
94	42	94	.0186	.0001	.05	.0187	" "
95	42	96	-1.0906	.0002	.17	-1.0904	" "
96	99	50	.8818	.0008	.80	.8826	" "
97	94	96	-1.1092	.0001	.12	-1.1091	" "
98	50	96	-1.5840	-.0001	-.09	-1.5841	" "
99	95	96	-5.0970	-.0009	-.94	-5.0979	" "
100	50	95	3.5130	.0008	.85	3.5138	" "

ADJUSTED POSITION DIFFERENCES (METERS)

FROM	TO	LAT.	V	LON.	V	H	V	
101	2001	2002	.0324	.0000	-.0156	.0000	-.0259	.0000 CFIT Adj 06/29/06

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

STATION				OBSERVED	V	N.V	ADJUSTED	SIGMA
121	42	SGP 7108 (1993)	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.22 NOT OBS.
122	42	SGP 7108 (1993)	LON	76 49 35.55	-8.12	-.54	76 49 27.43	.29 NOT OBS.
123	50	JPL 4005 WEST	LAT	39 1 18.02	-1.68	-.17	39 1 16.34	.22 NOT OBS.
124	50	JPL 4005 WEST	LON	76 49 37.51	-8.12	-.54	76 49 29.39	.29 NOT OBS.
125	94	VLBI RM PIER A	LAT	39 1 18.24	-.01	-.02	39 1 18.23	.21
126	94	VLBI RM PIER A	LON	76 49 27.09	.15	.38	76 49 27.24	.29
127	95	VLBI RM PIER B	LAT	39 1 16.36	-1.69	-.17	39 1 14.67	.22 NOT OBS.
128	95	VLBI RM PIER B	LON	76 49 38.36	-8.12	-.54	76 49 30.25	.29 NOT OBS.
129	96	VLBI RM PIER C	LAT	39 1 19.45	-1.68	-.17	39 1 17.76	.22 NOT OBS.
130	96	VLBI RM PIER C	LON	76 49 37.50	-8.12	-.54	76 49 29.38	.29 NOT OBS.

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA
131	99	7108 RM-1	LAT	39 1 18.37	-1.68	-.17	39 1 16.68	.22 NOT OBS.
132	99	7108 RM-1	LON	76 49 34.48	-8.12	-.54	76 49 26.36	.29 NOT OBS.
133	2001	MV-3 (Preliminary)	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.22 NOT OBS.
134	2001	MV-3 (Preliminary)	LON	76 49 35.55	-8.12	-.54	76 49 27.43	.29 NOT OBS.
135	2002	MV-3 (Final)	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.22 NOT OBS.
136	2002	MV-3 (Final)	LON	76 49 35.55	-8.12	-.54	76 49 27.43	.29 NOT OBS.
137	1030	ORANGE TGT 030 AZI	LAT	39 1 18.97	-1.69	-.17	39 1 17.29	.22 NOT OBS.
138	1030	ORANGE TGT 030 AZI	LON	76 49 35.52	-8.12	-.54	76 49 27.40	.29 NOT OBS.
139	1060	ORANGE TGT 060 AZI	LAT	39 1 18.96	-1.69	-.17	39 1 17.27	.22 NOT OBS.
140	1060	ORANGE TGT 060 AZI	LON	76 49 35.50	-8.12	-.54	76 49 27.38	.29 NOT OBS.
141	1090	ORANGE TGT 090 AZI	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.22 NOT OBS.
142	1090	ORANGE TGT 090 AZI	LON	76 49 35.49	-8.12	-.54	76 49 27.37	.29 NOT OBS.
143	1120	ORANGE TGT 120 AZI	LAT	39 1 18.91	-1.69	-.17	39 1 17.23	.22 NOT OBS.
144	1120	ORANGE TGT 120 AZI	LON	76 49 35.50	-8.12	-.54	76 49 27.38	.29 NOT OBS.
145	1150	ORANGE TGT 150 AZI	LAT	39 1 18.89	-1.69	-.17	39 1 17.21	.22 NOT OBS.
146	1150	ORANGE TGT 150 AZI	LON	76 49 35.52	-8.12	-.54	76 49 27.40	.29 NOT OBS.
147	1180	ORANGE TGT 180 AZI	LAT	39 1 18.89	-1.69	-.17	39 1 17.20	.22 NOT OBS.
148	1180	ORANGE TGT 180 AZI	LON	76 49 35.55	-8.12	-.54	76 49 27.43	.29 NOT OBS.
149	1210	ORANGE TGT 210 AZI	LAT	39 1 18.90	-1.69	-.17	39 1 17.21	.22 NOT OBS.
150	1210	ORANGE TGT 210 AZI	LON	76 49 35.58	-8.12	-.54	76 49 27.46	.29 NOT OBS.
151	1240	ORANGE TGT 240 AZI	LAT	39 1 18.91	-1.69	-.17	39 1 17.23	.22 NOT OBS.
152	1240	ORANGE TGT 240 AZI	LON	76 49 35.60	-8.12	-.54	76 49 27.48	.29 NOT OBS.
153	1270	ORANGE TGT 270 AZI	LAT	39 1 18.93	-1.69	-.17	39 1 17.25	.22 NOT OBS.
154	1270	ORANGE TGT 270 AZI	LON	76 49 35.61	-8.12	-.54	76 49 27.49	.29 NOT OBS.

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA
155	1300	ORANGE TGT 300 AZI	LAT	39 1 18.96	-1.69	-.17	39 1 17.27	.22 NOT OBS.
156	1300	ORANGE TGT 300 AZI	LON	76 49 35.60	-8.12	-.54	76 49 27.48	.29 NOT OBS.
157	1330	ORANGE TGT 330 AZI	LAT	39 1 18.97	-1.69	-.17	39 1 17.29	.22 NOT OBS.
158	1330	ORANGE TGT 330 AZI	LON	76 49 35.58	-8.12	-.54	76 49 27.46	.29 NOT OBS.
159	1360	ORANGE TGT 360 AZI	LAT	39 1 18.98	-1.69	-.17	39 1 17.29	.22 NOT OBS.
160	1360	ORANGE TGT 360 AZI	LON	76 49 35.55	-8.12	-.54	76 49 27.43	.29 NOT OBS.

GEODETIC LATITUDE CONSTRAINTS

	STATION	CONSTRAINED	V	N.V	ADJUSTED	SIGMA
161	42	39 1 18.93304	.00000	.00000	39 1 18.93304	.00002
162	50	39 1 18.02097	.00000	.00584	39 1 18.02097	.00002
163	94	39 1 19.91830	-.00001	-.32059	39 1 19.91829	.00002
164	95	39 1 16.36196	.00000	.05202	39 1 16.36196	.00002
165	96	39 1 19.44860	.00000	-.10629	39 1 19.44860	.00002
166	99	39 1 18.36753	.00001	.36905	39 1 18.36754	.00002
167	2001	39 1 18.93314	.00000	.00000	39 1 18.93314	.00002

GEODETIC LONGITUDE CONSTRAINTS

	STATION	CONSTRAINED	V	N.V	ADJUSTED	SIGMA
168	42	76 49 35.55078	.00000	.00000	76 49 35.55078	.00003
169	50	76 49 37.51233	.00000	.07863	76 49 37.51233	.00003
170	94	76 49 35.36084	.00000	.04482	76 49 35.36084	.00003
171	95	76 49 38.36408	.00001	.12501	76 49 38.36408	.00003
172	96	76 49 37.49768	.00000	-.08502	76 49 37.49768	.00002
173	99	76 49 34.47589	-.00001	-.16348	76 49 34.47588	.00003
174	2001	76 49 35.55082	.00000	.00000	76 49 35.55082	.00003

GEODETIC HEIGHT CONSTRAINTS

	STATION	CONSTRAINED	V	N.V	ADJUSTED	SIGMA
175	42	13.7450	-.0003	-.3	13.7447	.000
176	50	14.2390	.0006	.6	14.2396	.000
177	94	13.7640	-.0005	-.5	13.7635	.000
178	95	17.7530	.0006	.6	17.7536	.000
179	96	12.6560	-.0002	-.2	12.6558	.000
180	99	13.3550	-.0002	-.2	13.3548	.000
181	2001	18.0970	.0000	.0	18.0970	.001

ADJUSTED CARTESIAN COORDINATES

DX	DY	DZ	EPSILON	PSI	OMEGA	SCALE
.000	.000	.000	.000	.000	.000	.000

			TRANSFORMED COORDINATES		
STATION	X	Y	Z	X	Y	Z

42	SGP 7108 (1993)	1130794.761	-4831233.816	3994217.044
50	JPL 4005 WEST	1130752.940	-4831262.187	3994195.504
94	VLBI RM PIER A	1130794.853	-4831214.163	3994240.661
95	VLBI RM PIER B	1130740.952	-4831300.878	3994157.970
96	VLBI RM PIER C	1130746.686	-4831233.919	3994228.710
99	7108 RM-1	1130822.371	-4831238.319	3994203.251
2001	MV-3 (Preliminary)	1130795.530	-4831237.107	3994219.787
2002	MV-3 (Final)	1130795.536	-4831237.064	3994219.796
1030	ORANGE TGT 030 AZI	1130796.058	-4831236.171	3994220.726
1060	ORANGE TGT 060 AZI	1130796.623	-4831236.374	3994220.324
1090	ORANGE TGT 090 AZI	1130796.894	-4831236.760	3994219.785
1120	ORANGE TGT 120 AZI	1130796.804	-4831237.230	3994219.244
1150	ORANGE TGT 150 AZI	1130796.376	-4831237.654	3994218.854
1180	ORANGE TGT 180 AZI	1130795.715	-4831237.925	3994218.716
1210	ORANGE TGT 210 AZI	1130795.013	-4831237.962	3994218.869
1240	ORANGE TGT 240 AZI	1130794.452	-4831237.760	3994219.272
1270	ORANGE TGT 270 AZI	1130794.180	-4831237.370	3994219.813
1300	ORANGE TGT 300 AZI	1130794.272	-4831236.900	3994220.352
1330	ORANGE TGT 330 AZI	1130794.703	-4831236.475	3994220.742
1360	ORANGE TGT 360 AZI	1130795.357	-4831236.208	3994220.878

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO	STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.		STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
42	2002	AZ.6739.33	1.00	.00	.00	DX	.0012	1.00	.03	-.03	.7752	22 12 56.67	22 25 1.41
		DIST. .0011	.00	1.00	.00	DY	.0012	.03	1.00	.11	-3.2477	4.3266	.0384
		V.A. 59.79	.00	.00	1.00	DZ	.0012	-.03	.11	1.00	2.7515	0 30 29.13	202 25 1.41
2001	1030	AZ. 184.28	1.00	-.12	.04	DX	.0012	1.00	-.09	-.18	.5283	30 39 47.86	30 39 42.65
		DIST. .0011	-.12	1.00	-.02	DY	.0010	-.09	1.00	.22	.9355	1.4269	1.4267
		V.A.135.41	.04	-.02	1.00	DZ	.0011	-.18	.22	1.00	.9390	90 55 9.83	210 39 42.67
2001	1060	AZ. 210.02	1.00	-.05	.06	DX	.0012	1.00	-.15	-.23	1.0929	60 3 11.78	60 3 6.59
		DIST. .0011	-.05	1.00	-.04	DY	.0012	-.15	1.00	.25	.7326	1.4211	1.4209
		V.A.151.87	.06	-.04	1.00	DZ	.0012	-.23	.25	1.00	.5368	90 54 55.93	240 3 6.63
2001	1090	AZ. 183.38	1.00	.02	.04	DX	.0011	1.00	-.02	-.09	1.3637	89 22 15.04	89 22 9.90
		DIST. .0011	.02	1.00	.00	DY	.0011	-.02	1.00	.26	.3473	1.4072	1.4070
		V.A.138.60	.04	.00	1.00	DZ	.0011	-.09	.26	1.00	-.0022	90 55 15.85	269 22 9.94
2001	1120	AZ. 168.24	1.00	-.01	.02	DX	.0011	1.00	.08	.02	1.2736	119 18 45.18	119 18 40.09
		DIST. .0010	-.01	1.00	.01	DY	.0010	.08	1.00	.18	-.1235	1.3901	1.3899
		V.A.137.56	.02	.01	1.00	DZ	.0010	.02	.18	1.00	-.5432	90 56 59.13	299 18 40.12
2001	1150	AZ. 188.54	1.00	-.06	.00	DX	.0012	1.00	.13	.06	.8464	149 22 58.85	149 22 53.81
		DIST. .0011	-.06	1.00	.00	DY	.0011	.13	1.00	.09	-.5475	1.3733	1.3731
		V.A.153.37	.00	.00	1.00	DZ	.0011	.06	.09	1.00	-.9326	90 57 59.99	329 22 53.83

2001	1180	AZ. 182.27	1.00	.01	-.03	DX .0012	1.00	.08	.00	.1848	180 16 21.60	180 16 16.59
		DIST. .0011	.01	1.00	.01	DY .0010	.08	1.00	.13	-.8179	1.3601	1.3599
		V.A.141.01	-.03	.01	1.00	DZ .0010	.00	.13	1.00	-1.0709	90 57 44.69	0 16 16.59
2001	1210	AZ. 174.60	1.00	.14	-.02	DX .0012	1.00	.10	.02	-.5173	210 59 24.32	210 59 19.31
		DIST. .0011	.14	1.00	-.01	DY .0010	.10	1.00	.13	-.8549	1.3568	1.3566
		V.A.141.28	-.02	-.01	1.00	DZ .0010	.02	.13	1.00	-.9179	90 57 44.32	30 59 19.30
2001	1240	AZ. 164.85	1.00	.09	-.01	DX .0012	1.00	.08	.00	-1.0782	241 40 35.72	241 40 30.68
		DIST. .0012	.09	1.00	-.02	DY .0010	.08	1.00	.14	-.6531	1.3619	1.3617
		V.A.140.74	-.01	-.02	1.00	DZ .0010	.00	.14	1.00	-.5154	90 54 4.81	61 40 30.64
2001	1270	AZ. 179.97	1.00	-.26	.01	DX .0013	1.00	.24	.19	-1.3503	272 12 32.63	272 12 27.54
		DIST. .0014	-.26	1.00	-.03	DY .0011	.24	1.00	.26	-.2632	1.3759	1.3757
		V.A.142.26	.01	-.03	1.00	DZ .0011	.19	.26	1.00	.0265	90 58 18.96	92 12 27.50
2001	1300	AZ. 205.36	1.00	-.24	.03	DX .0013	1.00	.25	.20	-1.2579	302 22 26.25	302 22 21.10
		DIST. .0012	-.24	1.00	-.03	DY .0011	.25	1.00	.26	.2068	1.3946	1.3944
		V.A.140.42	.03	-.03	1.00	DZ .0011	.20	.26	1.00	.5655	90 57 7.41	122 22 21.07
2001	1330	AZ. 213.48	1.00	.02	.05	DX .0013	1.00	.24	.19	-.8268	332 5 11.84	332 5 6.65
		DIST. .0011	.02	1.00	-.01	DY .0011	.24	1.00	.27	.6316	1.4123	1.4122
		V.A.138.76	.05	-.01	1.00	DZ .0011	.19	.27	1.00	.9551	90 55 37.51	152 5 6.64

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO	STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.	STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
2001	1360	AZ. 159.00	1.00	-.03	.02	DX .0011	1.00	.01	-.05	-.1728	1 28 7.92	1 28 2.68
		DIST. .0011	-.03	1.00	-.02	DY .0010	.01	1.00	.18	.8984	1.4241	1.4240
		V.A.133.15	.02	-.02	1.00	DZ .0010	-.05	.18	1.00	1.0914	90 55 40.33	181 28 2.68

MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

		E Q U A T O R I A L S Y S T E M			HORIZON SYSTEM, ORIGIN AT THE STANDPOINT					
FROM	TO	ALTITUDE	AZIMUTH	DISTANCE	DN	SIGMA	DE	SIGMA	DU	SIGMA
42	2002	39 29 29.64	283 25 28.72	4.3266	.0355	.0013	.0145	.0013	4.3264	.0011
2001	1030	41 9 16.63	60 32 47.68	1.4269	1.2272	.0012	.7276	.0012	-.0229	.0009
2001	1060	22 11 33.01	33 50 5.62	1.4211	.7093	.0014	1.2312	.0012	-.0227	.0010
2001	1090	0 5 28.20	14 17 14.66	1.4072	.0155	.0013	1.4069	.0011	-.0226	.0009
2001	1120	23 0 1.67	354 27 46.18	1.3901	-.6805	.0011	1.2119	.0011	-.0230	.0009
2001	1150	42 46 32.17	327 6 11.61	1.3733	-1.1817	.0011	.6993	.0012	-.0232	.0010
2001	1180	51 56 24.50	282 44 .53	1.3601	-1.3599	.0011	-.0065	.0012	-.0228	.0009

2001	1210	42	34	12.27	238	49	28.99	1.3568	-1.1630	.0011	-.6985	.0012	-.0228	.0009
2001	1240	22	14	18.42	211	12	12.92	1.3619	-.6461	.0011	-1.1987	.0012	-.0214	.0009
2001	1270	1	6	13.42	191	1	45.98	1.3759	.0530	.0012	-1.3747	.0014	-.0233	.0009
2001	1300	23	55	14.60	170	39	51.12	1.3946	.7466	.0012	-1.1777	.0014	-.0232	.0010
2001	1330	42	33	3.17	142	37	27.79	1.4123	1.2479	.0012	-.6611	.0014	-.0229	.0010
2001	1360	50	1	40.44	100	53	21.04	1.4241	1.4235	.0011	.0365	.0011	-.0231	.0009

F.1.6 2002 Circle Fit Output for Orange Target (Horizontal Circle)

```
MV3 Antenna Survey 2002      Computation Date: 16 Sept 2008
Input from HAVAGO MV304_O1.HAV

Orange target on horizontal axis


Circle Radius: 1.3915932e+00
Circle Center: (3.1512532e-02, 1.6123756e-02)
```

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	1.2272000	0.7276000	0.0002052	0.0001221	-0.0002388
2	0.7093000	1.2312000	0.0001270	0.0002276	-0.0002607
3	0.0155000	1.4069000	-0.0000083	0.0007247	-0.0007247
4	-0.6805000	1.2119000	0.0000572	-0.0000961	0.0001118
5	-1.1817000	0.6993000	0.0006519	-0.0003671	0.0007482
6	-1.3599000	-0.0065000	0.0000033	0.0000001	0.0000033
7	-1.1630000	-0.6985000	0.0003132	0.0001873	0.0003649
8	-0.6461000	-1.1987000	-0.0002759	-0.0004946	-0.0005664
9	0.0530000	-1.3747000	0.0000093	-0.0006034	-0.0006034
10	0.7466000	-1.1777000	-0.0000062	0.0000104	0.0000121
11	1.2479000	-0.6611000	-0.0005332	0.0002969	0.0006103
12	1.4235000	0.0365000	-0.0005434	-0.0000080	0.0005434

```
           RADIUS =    1.3916 m
           DN =        +0.0315 m
           DE =        +0.0161 m
```

F.1.7 2003 Survey HAVAGO Output for North Quadrant (VLBI Antenna Azimuth 000 degrees) and East Quadrant (VLBI Antenna Azimuth 090 degrees

```
INPUT FILE IS MV303G1.TXT
 OUTPUT FILE IS MV303G1.HAV



    ********************************* GGAO GREENBELT, MARYLAND ******************

 This adjustment contains the observations made into the MV-3 Antenna target
 from the reference piers and marks located in the vicinity. The constrained position
 for the reference piers and marks were obtained from the ground network adjustment
 GGAO03A.HAV.

 This survey was conducted on October 31 and 3 November 2003.

 SEVEN SURVEY CONTROL STATIONS WHERE HELD CONSTRAINED FOR THIS ADJUSTMENT. THE GE
 POSITIONS AND HEIGHTS WHERE OBTAINED FROM THE UPDATED HAVAGO SITE ADJUSTMENT
 (GGAO03A2.OUT). THAT HAVAGO ADJUSTMENT CONTAINS THE SITE SURVEY DATA COLLECTED/O
 DURING THE YEARS 2000, 2001, 2002, AND 2003. FOR THAT ADJUSTMENT, THE ITRF2000
 COORDINATES OF SURVEY CONTROL STATION 7105 WHERE HELD CONSTRAINED.

 THE ADJUSTED DELTA NORTH, DELTA EAST AND DELTA UP VALUES FROM HAVAGO
 ADJUSTMENT (MV303G.HAV)  WERE USED AS INPUT TO THE
 CIRCLE FIT SOFTWARE PROGRAM TO PRODUCE DELTA LATITUDE, DELTA LONGITUDE, AND DELT
 VALUES FOR INPUT INTO THIS ADJUSTMENT TO DETERMINE THE GEODETIC POSITION AND
 HEIGHT OF THE MV3 VLBI ANTENNA AXES INTERSECTION.

   ***ASTRO POSITION FOR STA 94 FROM HAVAGO GGAO03A2.OUT;3****

   ****UPDATED WITH FINAL CIRCLE FIT SOLUTIONS 28 JUNE 2006 FOR MV-3 POSITION
       DIFFERENCE  (STA 2001 TO STA 2002)****

 *



 FLAGS IN INPUT DATA:
    *  DELETED OBSERVATION
    #  DEWEIGHTED OBSERVATION
1INPUT                                                    DATE: 06-12-**  TIME: 14:31:00   PAGE    1

 STATION DATA

 STATION  GEODETIC LAT.   GEODETIC LON.    GEOD.HT.  GEOD. ST. ERRORS (M)    STATION NAME                    CODES
 NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON.  ELEV.     ASTR. ST. ERRORS            X             Y             Z
```

42	39	1	18.93304	76	49	35.55077	13.745	.001	.001	.001	7108		1	1	1
42	0	0	.00	0	0	.00		10.00	15.00						
50	39	1	18.02097	76	49	37.51232	14.239	.001	.001	.001	JPL 4005 WEST		1	1	1
50	0	0	.00	0	0	.00		10.00	15.00						
94	39	1	19.91830	76	49	35.36085	13.764	.001	.001	.001	GGAO VLBI RM PIER A		1	1	1
94	39	1	18.24	76	49	27.09		.30	.40						
95	39	1	16.36195	76	49	38.36408	17.753	.001	.001	.001	GGAO VLBI RM PIER B		1	1	1
95	0	0	.00	0	0	.00		10.00	15.00						
96	39	1	19.44860	76	49	37.49767	12.656	.001	.001	.001	GGAO VLBI RM PIER C		1	1	1
96	0	0	.00	0	0	.00		10.00	15.00						
99	39	1	18.36752	76	49	34.47588	13.356	.001	.001	.001	7108 RM-1		1	1	1
99	0	0	.00	0	0	.00		10.00	15.00						
2001	39	1	18.93311	76	49	35.55097	17.041	.001	.001	.001	MV-3 (PRELIMINARY)		1	1	1
2001	0	0	.00	0	0	.00		10.00	15.00						
2000	39	1	18.93311	76	49	35.55097	17.041	.000	.000	.000	MV-3 VLBI ANTENNA		0	0	0
2000	0	0	.00	0	0	.00		10.00	15.00						
115	39	1	19.05364	76	49	35.55004	17.798	.000	.000	.000	AZ 0, EL 15 DEGREE		0	0	0
115	0	0	.00	0	0	.00		10.00	15.00						
130	39	1	19.04089	76	49	35.55009	18.908	.000	.000	.000	AZ 0, EL 30 DEGREE		0	0	0
130	0	0	.00	0	0	.00		10.00	15.00						
145	39	1	19.02144	76	49	35.55010	19.531	.000	.000	.000	AZ 0, EL 45 DEGREE		0	0	0
145	0	0	.00	0	0	.00		10.00	15.00						
160	39	1	18.99355	76	49	35.55009	20.168	.000	.000	.000	AZ 0, EL 60 DEGREE		0	0	0
160	0	0	.00	0	0	.00		10.00	15.00						
175	39	1	18.89355	76	49	35.55008	20.330	.000	.000	.000	AZ 0, EL 75 DEGREE		0	0	0
175	0	0	.00	0	0	.00		10.00	15.00						
190	39	1	18.93317	76	49	35.55022	20.668	.000	.000	.000	AZ 0, EL 90 DEGREE		0	0	0
190	0	0	.00	0	0	.00		10.00	15.00						
1105	39	1	18.92011	76	49	35.55025	20.320	.000	.000	.000	AZ 0, EL 105 DEGREE		0	0	0
1105	0	0	.00	0	0	.00		10.00	15.00						
1120	39	1	18.91015	76	49	35.55027	19.912	.000	.000	.000	AZ 0, EL 120 DEGREE		0	0	0
1120	0	0	.00	0	0	.00		10.00	15.00						
1135	39	1	18.84467	76	49	35.55049	19.546	.000	.000	.000	AZ 0, EL 135 DEGREE		0	0	0
1135	0	0	.00	0	0	.00		10.00	15.00						

STATION DATA

STATION NUMBER	GEODETIC LAT. / ASTRONOMIC LAT.	GEODETIC LON. / ASTRONOMIC LON.	GEOD.HT. / ELEV.	GEOD. ST. ERRORS (M) / ASTR. ST. ERRORS	STATION NAME / X / Y	CODES / Z
1150	39 1 18.83461	76 49 35.55045	18.223	.000 .000 .000	AZ 0, EL 150 DEGREE	0 0 0
1150	0 0 .00	0 0 .00		10.00 15.00		
1165	39 1 18.81277	76 49 35.55059	17.882	.000 .000 .000	AZ 0, EL 165 DEGREE	0 0 0
1165	0 0 .00	0 0 .00		10.00 15.00		
215	39 1 18.93317	76 49 35.24022	17.830	.000 .000 .000	AZ 90, EL 15 DEGREE	0 0 0
215	0 0 .00	0 0 .00		10.00 15.00		
230	39 1 18.93317	76 49 35.31321	18.917	.000 .000 .000	AZ 90, EL 30 DEGREE	0 0 0
230	0 0 .00	0 0 .00		10.00 15.00		
245	39 1 18.93317	76 49 35.39705	19.531	.000 .000 .000	AZ 90, EL 45 DEGREE	0 0 0
245	0 0 .00	0 0 .00		10.00 15.00		
260	39 1 18.93317	76 49 35.42803	20.176	.000 .000 .000	AZ 90, EL 60 DEGREE	0 0 0
260	0 0 .00	0 0 .00		10.00 15.00		
275	39 1 18.93317	76 49 35.49803	20.387	.000 .000 .000	AZ 90, EL 75 DEGREE	0 0 0
275	0 0 .00	0 0 .00		10.00 15.00		
290	39 1 18.93317	76 49 35.55022	20.668	.000 .000 .000	AZ 90, EL 90 DEGREE	0 0 0
290	0 0 .00	0 0 .00		10.00 15.00		
2105	39 1 18.93317	76 49 35.61024	20.377	.000 .000 .000	AZ 90, EL 105 DEGREE	0 0 0
2105	0 0 .00	0 0 .00		10.00 15.00		
2120	39 1 18.93317	76 49 35.66021	20.180	.000 .000 .000	AZ 90, EL 120 DEGREE	0 0 0
2120	0 0 .00	0 0 .00		10.00 15.00		
2150	39 1 18.93317	76 49 35.77022	18.311	.000 .000 .000	AZ 90, EL 150 DEGREE	0 0 0
2150	0 0 .00	0 0 .00		10.00 15.00		
2165	39 1 18.93317	76 49 35.81022	17.881	.000 .000 .000	AZ 90, EL 165 DEGREE	0 0 0
2165	0 0 .00	0 0 .00		10.00 15.00		

1INPUT DATE: 06-12-** TIME: 14:31:00 PAGE 3

DIRECTIONS

	FROM	TO	LIST	OBSERVED	MM	SEC.	
1	50	96	1	0 0 .00	1.0	1.0	NNP 10/31/03 T-3000
2	50	115	1	55 31 10.90	1.0	1.0	
3	50	130	1	55 50 23.42	1.0	1.0	
4	50	145	1	56 21 25.88	1.0	1.0	
5	50	160	1	57 2 18.40	1.0	1.0	

6	50	175	1	57	50	48.90	1.0	1.0	
7	50	190	1	58	43	56.02	1.0	1.0	
8	50	1105	1	59	38	9.38	1.0	1.0	
9	50	1120	1	60	29	26.20	1.0	1.0	
10	50	1135	1	61	14	18.28	1.0	1.0	
11	50	1150	1	61	49	18.15	1.0	1.0	
12	50	1165	1	62	11	22.62	1.0	1.0	
13	96	50	1	0	0	.00	1.0	1.0	NNP 10/31/03 T-3000
14	96	115	1	284	6	7.85	1.0	1.0	
15	96	130	1	284	32	22.42	1.0	1.0	
16	96	145	1	285	14	5.70	1.0	1.0	
17	96	160	1	286	7	59.45	1.0	1.0	
18	96	175	1	287	10	11.10	1.0	1.0	
19	96	190	1	288	16	13.88	1.0	1.0	
20	96	1105	1	289	21	40.50	1.0	1.0	
21	96	1120	1	290	21	42.78	1.0	1.0	
22	96	1135	1	291	12	42.35	1.0	1.0	
23	96	1150	1	291	51	34.55	1.0	1.0	
24	96	1165	1	292	15	48.32	1.0	1.0	
25	94	99	1	0	0	.00	1.0	1.0	JLL 10/31/03 T-2000
26	94	115	1	33	42	21.75	1.0	1.0	
27	94	130	1	33	34	19.08	1.0	1.0	
28	94	145	1	33	21	51.18	1.0	1.0	
29	94	160	1	33	6	28.55	1.0	1.0	
30	94	175	1	32	49	33.98	1.0	1.0	
31	94	190	1	32	32	22.05	1.0	1.0	
32	94	1105	1	32	16	18.72	1.0	1.0	
33	99	94	1	0	0	.00	1.0	1.0	JLL 10/31/03 T-2000
34	99	145	1	331	58	9.32	1.0	1.0	
35	99	160	1	330	51	20.70	1.0	1.0	
36	99	175	1	329	31	6.15	1.0	1.0	
37	99	190	1	328	1	33.00	1.0	1.0	
38	99	1105	1	326	28	28.58	1.0	1.0	
39	99	1120	1	324	59	4.08	1.0	1.0	
40	99	1135	1	323	39	53.02	1.0	1.0	
41	99	1150	1	322	37	23.23	1.0	1.0	
42	99	1165	1	321	57	28.95	1.0	1.0	
43	94	99	2	0	0	.00	1.0	1.0	JLL 11/03/03 T-2000
44	94	275	2	30	40	53.12	1.0	1.0	
45	94	290	2	32	31	50.65	1.0	1.0	
46	94	2105	2	34	21	13.10	1.0	1.0	
47	94	2120	2	36	3	.02	1.0	1.0	
48	94	2150	2	38	34	33.35	1.0	1.0	
49	94	2165	2	39	15	24.28	1.0	1.0	
50	95	50	1	0	0	.00	1.0	1.0	

1INPUT DATE: 06-12-** TIME: 14:31:00 PAGE 4

DIRECTIONS

FROM	TO	LIST	OBSERVED	MM	SEC.

51	95	245	1	19 46 55.42	1.0	1.0		
52	95	260	1	19 27 26.28	1.0	1.0		
53	95	99	2	0 0 .00	1.0	1.0	JLL 11/03/03 T-2000	
54	95	2165	2	342 21 52.75	1.0	1.0		
55	99	50	2	0 0 .00	1.0	1.0	JLL 11/03/03 T-2000	
56	99	215	2	46 33 15.55	1.0	1.0		
57	99	230	2	46 4 43.88	1.0	1.0		
58	99	245	2	45 20 20.22	1.0	1.0		
59	99	94	3	0 0 .00	1.0	1.0	JLL 11/03/03 T-2000	
60	99	260	3	330 5 4.50	1.0	1.0		
61	99	275	3	329 3 15.68	1.0	1.0		
62	99	290	3	328 0 7.95	1.0	1.0		
63	99	2120	3	326 7 14.20	1.0	1.0		
64	94	96	3	0 0 .00	1.0	1.0	NNP 11/03/03 T-3000	
65	94	215	3	287 19 36.90	1.0	1.0		
66	94	230	3	288 2 47.15	1.0	1.0		
67	94	245	3	289 11 45.50	1.0	1.0		
68	94	260	3	290 41 28.30	1.0	1.0		
69	96	50	2	0 0 .00	1.0	1.0	NNP 11/03/03 T-3000	
70	96	275	2	287 55 29.52	1.0	1.0		
71	96	290	2	288 17 19.15	1.0	1.0		
72	96	2105	2	288 39 51.75	1.0	1.0		
73	96	2120	2	289 1 55.75	1.0	1.0		
74	96	2150	2	289 36 53.45	1.0	1.0		
75	96	2165	2	289 46 50.52	1.0	1.0		
76	50	96	2	0 0 .00	1.0	1.0	NNP 11/03/03	
77	50	260	2	59 44 55.48	1.0	1.0		
78	50	275	2	59 16 28.62	1.0	1.0		
79	50	290	2	58 44 56.22	1.0	1.0		
80	50	2105	2	58 12 32.98	1.0	1.0		
81	50	2120	2	57 41 8.38	1.0	1.0		
82	50	2150	2	56 51 45.48	1.0	1.0		
83	50	2165	2	56 37 53.80	1.0	1.0		

1INPUT DATE: 06-12-** TIME: 14:31:00 PAGE 5

GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	MM	SEC.	H.I.	H.T.	K1	K2	
84	94	115	-1	82 0 39.38	1.0	2.0	.237	.000	.00	.00	JLL 10/31/03
85	94	130	-1	80 12 46.98	1.0	2.0	.237	.000	.00	.00	
86	94	145	-1	78 50 5.72	1.0	2.0	.237	.000	.00	.00	
87	94	160	-1	77 57 27.40	1.0	2.0	.237	.000	.00	.00	
88	94	175	-1	77 36 18.90	1.0	2.0	.237	.000	.00	.00	
89	94	190	-1	77 45 2.08	1.0	2.0	.237	.000	.00	.00	
90	94	1105	-1	78 20 43.25	1.0	2.0	.237	.000	.00	.00	JLL 10/31/03
91	99	145	-1	81 57 16.50	3.0	2.0	1.536	.000	.00	.00	" "
92	99	160	-1	80 46 16.58	3.0	2.0	1.536	.000	.00	.00	
93	99	175	-1	79 56 8.05	3.0	2.0	1.536	.000	.00	.00	
94	99	190	-1	79 31 3.08	3.0	2.0	1.536	.000	.00	.00	
95	99	1105	-1	79 34 5.18	3.0	2.0	1.536	.000	.00	.00	

96	99	1120	-1	80	6	26.78	3.0	2.0	1.536	.000	.00	.00	
97	99	1135	-1	81	7	10.02	3.0	2.0	1.536	.000	.00	.00	
98	99	1150	-1	82	33	13.42	3.0	2.0	1.536	.000	.00	.00	
99	99	1165	-1	84	18	10.82	3.0	2.0	1.536	.000	.00	.00	JLL 10/31/03
100	96	115	-1	84	12	40.85	1.0	2.0	.234	.000	.00	.00	NNP 10/31/03
101	96	130	-1	83	7	55.72	1.0	2.0	.234	.000	.00	.00	
102	96	145	-1	82	13	32.20	1.0	2.0	.234	.000	.00	.00	
103	96	160	-1	81	33	17.18	1.0	2.0	.234	.000	.00	.00	
104	96	175	-1	81	9	33.22	1.0	2.0	.234	.000	.00	.00	
105	96	190	-1	81	3	42.45	1.0	2.0	.234	.000	.00	.00	
106	96	1105	-1	81	15	55.80	1.0	2.0	.234	.000	.00	.00	
107	96	1120	-1	81	44	58.60	1.0	2.0	.234	.000	.00	.00	
108	96	1135	-1	82	28	36.82	1.0	2.0	.234	.000	.00	.00	
109	96	1150	-1	83	24	6.58	1.0	2.0	.234	.000	.00	.00	
110	96	1165	-1	84	27	26.08	1.0	2.0	.234	.000	.00	.00	" "
111	50	115	-1	87	50	48.22	3.0	2.0	1.420	.000	.00	.00	NNP 10/31/03
112	50	130	-1	86	53	43.90	3.0	2.0	1.420	.000	.00	.00	
113	50	145	-1	86	3	57.20	3.0	2.0	1.420	.000	.00	.00	
114	50	160	-1	85	24	35.88	3.0	2.0	1.420	.000	.00	.00	
115	50	175	-1	84	58	20.25	3.0	2.0	1.420	.000	.00	.00	
116	50	190	-1	84	47	9.75	3.0	2.0	1.420	.000	.00	.00	
117	50	1105	-1	84	52	25.00	3.0	2.0	1.420	.000	.00	.00	
118	50	1120	-1	85	13	59.60	3.0	2.0	1.420	.000	.00	.00	
119	50	1135	-1	85	50	52.85	3.0	2.0	1.420	.000	.00	.00	
120	50	1150	-1	86	40	50.55	3.0	2.0	1.420	.000	.00	.00	
121	50	1165	-1	87	40	10.20	3.0	2.0	1.420	.000	.00	.00	
122	94	275	-1	77	57	1.08	1.0	2.0	.239	.000	.00	.00	JLL 11/03/03
123	94	290	-1	77	45	40.02	1.0	2.0	.239	.000	.00	.00	
124	94	2105	-1	78	3	2.70	1.0	2.0	.239	.000	.00	.00	
125	94	2120	-1	78	47	53.72	1.0	2.0	.239	.000	.00	.00	
126	94	2150	-1	81	24	29.22	1.0	2.0	.239	.000	.00	.00	
127	94	2165	-1	83	5	50.52	1.0	2.0	.239	.000	.00	.00	
128	95	245	-1	89	10	4.08	1.0	2.0	.238	.000	.00	.00	JLL 11/03/03
129	95	260	-1	88	49	49.18	1.0	2.0	.238	.000	.00	.00	
130	95	2165	-1	90	5	57.95	1.0	2.0	.239	.000	.00	.00	
131	99	215	-1	84	0	54.98	3.0	2.0	1.487	.000	.00	.00	JLL 11/03/03
132	99	230	-1	82	13	56.38	3.0	2.0	1.487	.000	.00	.00	
133	99	245	-1	80	48	32.30	3.0	2.0	1.487	.000	.00	.00	

GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	MM	SEC.	H.I.	H.T.	K1	K2	
134	99	260	-1	79 50 50.30	3.0	2.0	1.487	.000	.00	.00	
135	99	275	-1	79 23 14.48	3.0	2.0	1.487	.000	.00	.00	
136	99	290	-1	79 25 22.85	3.0	2.0	1.487	.000	.00	.00	
137	99	2120	-1	80 48 8.42	3.0	2.0	1.487	.000	.00	.00	
138	94	215	-1	82 52 56.30	1.0	2.0	.239	.000	.00	.00	NNP 11/03/03
139	94	230	-1	81 9 52.20	1.0	2.0	.239	.000	.00	.00	
140	94	245	-1	79 42 23.52	1.0	2.0	.239	.000	.00	.00	

141	94	260	-1	78 36 38.90	1.0	2.0	.239	.000	.00	.00		
142	96	275	-1	81 22 50.28	1.0	2.0	.237	.000	.00	.00		
143	96	290	-1	81 3 59.95	1.0	2.0	.237	.000	.00	.00		
144	96	2105	-1	81 2 39.08	1.0	2.0	.237	.000	.00	.00		
145	96	2120	-1	81 19 56.10	1.0	2.0	.237	.000	.00	.00		
146	96	2150	-1	82 47 41.18	1.0	2.0	.237	.000	.00	.00		
147	96	2165	-1	83 53 .25	1.0	2.0	.237	.000	.00	.00		
148	50	260	-1	85 27 25.12	3.0	2.0	1.413	.000	.00	.00	NNP 11/03/03	
149	50	275	-1	84 59 50.38	3.0	2.0	1.413	.000	.00	.00		
150	50	290	-1	84 46 51.42	3.0	2.0	1.413	.000	.00	.00		
151	50	2105	-1	84 50 2.50	3.0	2.0	1.413	.000	.00	.00		
152	50	2120	-1	85 10 3.22	3.0	2.0	1.413	.000	.00	.00		
153	50	2150	-1	86 35 51.72	3.0	2.0	1.413	.000	.00	.00		
154	50	2165	-1	87 36 15.40	3.0	2.0	1.413	.000	.00	.00		

1INPUT DATE: 06-12-** TIME: 14:31:00 PAGE 7

ELEVATION DIFFERENCES

	FROM	TO	OBSERVED	S.E.	
155	42	99	-.388	.001	HAVAGO GGAO03A2
156	99	94	.407	.001	HAVAGO GGAO03A2
157	42	94	.019	.001	" "
158	42	96	-1.091	.001	" "
159	99	50	.882	.001	" "
160	94	96	-1.109	.001	" "
161	50	96	-1.584	.001	" "
162	95	96	-5.097	.001	" "
163	50	95	3.513	.001	" "

POSITION DIFFERENCES (METERS)

	FROM	TO	LAT.	S.E.	LON.	S.E.	HEIGHT	S.E.	
164	2001	2000	.0030	.0010	-.0051	.0010	-.2270	.0010	CFIT 03 JLL

ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

	FROM	TO
165	94	42
166	94	50
167	94	95
168	94	96
169	94	99
170	94	115
171	94	130
172	94	145
173	94	160

```
   174   94  175
   175   94  190
   176   94 1105
   177   94 1120
   178   94 1135
   179   94 1150
   180   94 1165
   181   94  215
   182   94  230
   183   94  245
   184   94  260
   185   94  275
   186   94  290
   187   94 2105
   188   94 2120
   189   94 2150
   190   94 2165
   191   94 2000
   192   94 2001
1INPUT                                                    DATE: 06-12-**  TIME: 14:31:00   PAGE    8


 A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

                                VECTOR SUM OF

 DIRECTIONS                   1.0 MM     1.0 SEC.
 AZIMUTHS                     2.0 MM     1.3 SEC.
 RECIPROCAL VERTICAL ANGLES   7.0 MM     9.0 SEC.
 GROUPED VERTICAL ANGLES      3.0 MM     5.0 SEC.
 ABSOLUTE DISTANCES           5.0 MM     9.9 PPM
 RELATIVE DISTANCES           5.0 MM     9.9 PPM
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD         HAVAGO VERSION 90.07.18       DATE: 06-12-**  TIME: 14:31:00   PAGE    9

 JOB STATISTICS


 ELLIPSOID:  ITRF2000         A = 6378137.000   1/F = 298.2572221

    ********************************* GGAO GREENBELT, MARYLAND ******************

 STANDARD ERROR OF UNIT WEIGHT =   .77, VARIANCE =   .59,  88 DEGREES OF FREEDOM.


   246 OBSERVATIONS                                      3 ITERATIONS
    83 DIRECTIONS                                       29 STATIONS
     0 ASTR. AZIMUTHS                                  158 UNKNOWNS
     0 REC. VERTICAL ANGLES                             12 LISTS OF DIRECTIONS
    71 GROUPED VERTICAL ANGLES                           1 REFRACTION UNKNOWNS
```

```
    0 ABSOLUTE DISTANCES                                    0 SCALE UNKNOWNS
    0 RELATIVE DISTANCES
    9 ELEVATION DIFFERENCES
    1 LAT., LON., HEIGHT DIFFERENCES
    0 PLANE DISTANCES
    1 OBSERVED ASTR. LATITUDES
    1 OBSERVED ASTR. LONGITUDES
    7 CONSTRAINED GEOD. LATITUDES
    7 CONSTRAINED GEOD. LONGITUDES
    7 CONSTRAINED GEOD. HEIGHTS
   28 ASTR. POSITION DIFFERENCES

 DK/DH ASSUMED AS   -.010/1000 IF K VALUES NOT INPUT.


 SELECTED OPTIONS:

 CC  FLAG   OPTION

 31   9   ITERATIONS
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD         HAVAGO VERSION 90.07.18       DATE: 06-12-**  TIME: 14:31:00   PAGE   10

 ADJUSTED DATA: STATIONS
```

STATION		LATITUDE	SIGMA	LONGITUDE	SIGMA	HEIGHT	SIGMA
42	7108	39 1 18.93304	.00002	76 49 35.55077	.00003	13.745	.000
50	JPL 4005 WEST	39 1 18.02098	.00002	76 49 37.51233	.00002	14.238	.000
94	GGAO VLBI RM PIER A	39 1 19.91831	.00002	76 49 35.36085	.00003	13.764	.000
95	GGAO VLBI RM PIER B	39 1 16.36195	.00002	76 49 38.36408	.00003	17.753	.000
96	GGAO VLBI RM PIER C	39 1 19.44859	.00002	76 49 37.49766	.00003	12.656	.000
99	7108 RM-1	39 1 18.36751	.00002	76 49 34.47588	.00003	13.356	.000
2001	MV-3 (PRELIMINARY)	39 1 18.93311	.00002	76 49 35.55097	.00003	17.041	.001
2000	MV-3 VLBI ANTENNA	39 1 18.93321	.00004	76 49 35.55076	.00005	16.814	.001
115	AZ 0, EL 15 DEGREE	39 1 19.05404	.00003	76 49 35.55044	.00004	17.796	.001
130	AZ 0, EL 30 DEGREE	39 1 19.04163	.00003	76 49 35.55045	.00004	18.730	.001
145	AZ 0, EL 45 DEGREE	39 1 19.02180	.00003	76 49 35.55046	.00004	19.531	.001
160	AZ 0, EL 60 DEGREE	39 1 18.99600	.00003	76 49 35.55049	.00004	20.146	.001
175	AZ 0, EL 75 DEGREE	39 1 18.96592	.00003	76 49 35.55049	.00004	20.533	.001
190	AZ 0, EL 90 DEGREE	39 1 18.93357	.00003	76 49 35.55048	.00004	20.668	.001
1105	AZ 0, EL 105 DEGREE	39 1 18.90113	.00003	76 49 35.55051	.00004	20.539	.001
1120	AZ 0, EL 120 DEGREE	39 1 18.87099	.00003	76 49 35.55055	.00005	20.155	.001
1135	AZ 0, EL 135 DEGREE	39 1 18.84505	.00003	76 49 35.55053	.00005	19.545	.001
1150	AZ 0, EL 150 DEGREE	39 1 18.82507	.00003	76 49 35.55051	.00006	18.746	.001
1165	AZ 0, EL 165 DEGREE	39 1 18.81255	.00003	76 49 35.55058	.00006	17.816	.001
215	AZ 90, EL 15 DEGREE	39 1 18.93289	.00005	76 49 35.39589	.00004	17.799	.001
230	AZ 90, EL 30 DEGREE	39 1 18.93290	.00005	76 49 35.41177	.00004	18.730	.001
245	AZ 90, EL 45 DEGREE	39 1 18.93290	.00004	76 49 35.43717	.00004	19.531	.001
260	AZ 90, EL 60 DEGREE	39 1 18.93295	.00003	76 49 35.47032	.00004	20.146	.001
275	AZ 90, EL 75 DEGREE	39 1 18.93298	.00003	76 49 35.50889	.00004	20.533	.001

290	AZ 90, EL 90 DEGREE			39	1	18.93301	.00003		76	49	35.55039	.00004		20.668	.001			
2105	AZ 90, EL 105 DEGREE			39	1	18.93305	.00003		76	49	35.59168	.00004		20.539	.001			
2120	AZ 90, EL 120 DEGREE			39	1	18.93307	.00003		76	49	35.63055	.00004		20.155	.001			
2150	AZ 90, EL 150 DEGREE			39	1	18.93311	.00003		76	49	35.68936	.00004		18.746	.001			
2165	AZ 90, EL 165 DEGREE			39	1	18.93311	.00003		76	49	35.70543	.00004		17.815	.001			

ADJUSTED DATA: DIRECTIONS

	FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.	
1	50	96	1	0 0 .00	-.35	-.07	0 0 .00	44.054	0 27 37.74	92 3 32.36	NNP 10/31/03 T-3000
2	50	115	1	55 31 10.90	1.60	.43	55 31 12.84	57.051	55 58 50.59	86 25 27.74	
3	50	130	1	55 50 23.42	1.23	.33	55 50 25.00	56.904	56 18 2.74	85 28 18.54	
4	50	145	1	56 21 25.88	.08	.02	56 21 26.31	56.637	56 49 4.05	84 38 12.12	
5	50	160	1	57 2 18.40	.61	.16	57 2 19.35	56.268	57 29 57.09	83 58 21.70	
6	50	175	1	57 50 48.90	-1.27	-.33	57 50 47.98	55.821	58 18 25.72	83 31 27.52	
7	50	190	1	58 43 56.02	-1.19	-.31	58 43 55.18	55.322	59 11 32.92	83 19 30.50	
8	50	1105	1	59 38 9.38	-.43	-.11	59 38 9.29	54.804	60 5 47.03	83 23 52.11	
9	50	1120	1	60 29 26.20	-.17	-.04	60 29 26.37	54.306	60 57 4.11	83 44 39.10	
10	50	1135	1	61 14 18.28	-.13	-.03	61 14 18.49	53.862	61 41 56.24	84 20 41.53	
11	50	1150	1	61 49 18.15	-.16	-.04	61 49 18.34	53.501	62 16 56.08	85 9 58.66	
12	50	1165	1	62 11 22.62	-.14	-.04	62 11 22.82	53.251	62 39 .57	86 8 46.24	
13	96	50	1	0 0 .00	.14	.03	0 0 .00	44.054	180 27 37.75	87 56 29.06	NNP 10/31/03 T-3000
14	96	115	1	284 6 7.85	-1.39	-.32	284 6 6.32	48.668	104 33 44.07	83 56 11.60	
15	96	130	1	284 32 22.42	-.96	-.22	284 32 21.31	48.872	104 59 59.06	82 51 32.69	
16	96	145	1	285 14 5.70	.88	.20	285 14 6.43	49.138	105 41 44.18	81 57 19.21	
17	96	160	1	286 7 59.45	.84	.20	286 8 .15	49.446	106 35 37.89	81 17 10.22	
18	96	175	1	287 10 11.10	-.39	-.09	287 10 10.56	49.775	107 37 48.31	80 53 35.40	
19	96	190	1	288 16 13.88	1.88	.44	288 16 15.62	50.104	108 43 53.36	80 47 50.39	
20	96	1105	1	289 21 40.50	1.35	.32	289 21 41.71	50.409	109 49 19.45	81 0 8.05	
21	96	1120	1	290 21 42.78	-.20	-.05	290 21 42.44	50.669	110 49 20.18	81 29 15.15	
22	96	1135	1	291 12 42.35	-.92	-.22	291 12 41.29	50.870	111 40 19.03	82 12 55.93	
23	96	1150	1	291 51 34.55	-.57	-.14	291 51 33.84	50.998	112 19 11.59	83 8 26.03	
24	96	1165	1	292 15 48.32	-.63	-.15	292 15 47.55	51.041	112 43 25.30	84 11 44.84	
25	94	99	1	0 0 .00	-1.12	-.28	0 0 .00	52.349	156 0 18.86	90 26 42.19	JLL 10/31/03 T-2000
26	94	115	1	33 42 21.75	2.04	.27	33 42 24.92	27.339	189 42 43.78	81 31 10.09	
27	94	130	1	33 34 19.08	1.47	.20	33 34 21.67	27.863	189 34 40.53	79 43 58.37	
28	94	145	1	33 21 51.18	1.14	.16	33 21 53.44	28.608	189 22 12.30	78 22 7.90	
29	94	160	1	33 6 28.55	1.95	.28	33 6 31.63	29.504	189 6 50.49	77 30 27.98	
30	94	175	1	32 49 33.98	-2.12	-.31	32 49 32.99	30.483	188 49 51.84	77 10 10.73	
31	94	190	1	32 32 22.05	-.65	-.10	32 32 22.52	31.474	188 32 41.38	77 19 44.43	
32	94	1105	1	32 16 18.72	.25	.04	32 16 20.09	32.414	188 16 38.95	77 56 8.38	
33	99	94	1	0 0 .00	-.07	-.02	0 0 .00	52.349	336 0 19.42	89 33 19.51	JLL 10/31/03 T-2000
34	99	145	1	331 58 9.32	1.29	.21	331 58 10.69	33.368	307 58 30.10	79 20 14.37	
35	99	160	1	330 51 20.70	2.33	.37	330 51 23.10	33.015	306 51 42.52	78 8 3.74	
36	99	175	1	329 31 6.15	-2.78	-.43	329 31 3.45	32.562	305 31 22.86	77 16 9.98	
37	99	190	1	328 1 33.00	1.45	.22	328 1 34.52	32.037	304 1 53.94	76 48 35.57	

38	99	1105	1	326	28	28.58	2.06	.31	326	28	30.71	31.474	302	28	50.13	76 48 40.62	
39	99	1120	1	324	59	4.08	-.63	-.09	324	59	3.52	30.913	300	59	22.94	77 17 49.10	
40	99	1135	1	323	39	53.02	-1.71	-.25	323	39	51.38	30.388	299	40	10.80	78 15 5.09	
41	99	1150	1	322	37	23.23	-1.19	-.17	322	37	22.12	29.940	298	37	41.53	79 37 55.89	
42	99	1165	1	321	57	28.95	-1.25	-.18	321	57	27.77	29.607	297	57	47.19	81 20 16.27	
43	94	99	2	0	0	.00	-.25	-.06	0	0	.00	52.349	156	0	18.86	90 26 42.19	JLL 11/03/03 T-2000
44	94	275	2	30	40	53.12	-1.36	-.20	30	40	52.01	31.333	186	41	10.87	77 31 21.69	
45	94	290	2	32	31	50.65	-1.06	-.16	32	31	49.83	31.491	188	32	8.69	77 20 9.83	
46	94	2105	2	34	21	13.10	-.95	-.14	34	21	12.39	31.621	190	21	31.25	77 37 37.07	

ADJUSTED DATA: DIRECTIONS

FROM	TO	LIST	OBSERVED	V	N.V	ADJUSTED	DIST.	AZ.	V.A.	
47	94 2120	2	36 3 .02	-.16	-.02	36 3 .10	31.718	192 3 18.96	78 22 30.00	
48	94 2150	2	38 34 33.35	2.55	.39	38 34 36.14	31.785	194 34 55.00	80 58 52.66	
49	94 2165	2	39 15 24.28	1.56	.24	39 15 26.09	31.752	195 15 44.95	82 40 8.33	
50	95 50	1	0 0 .00	1.34	.35	0 0 .00	55.223	21 49 37.70	93 38 56.33	
51	95 245	1	19 46 55.42	-.83	-.38	19 46 53.26	106.048	41 36 30.96	89 2 20.01	
52	95 260	1	19 27 26.28	.40	.18	19 27 25.34	105.534	41 17 3.04	88 42 1.24	
53	95 99	2	0 0 .00	.84	.40	0 0 .00	112.218	56 31 37.55	92 14 40.82	JLL 11/03/03 T-2000
54	95 2165	2	342 21 52.75	-.98	-.43	342 21 50.93	101.868	38 53 28.47	89 57 52.48	
55	99 50	2	0 0 .00	.11	.04	0 0 .00	73.826	261 40 41.61	89 19 2.84	JLL 11/03/03 T-2000
56	99 215	2	46 33 15.55	.13	.02	46 33 15.58	28.522	308 13 57.18	81 2 30.03	
57	99 230	2	46 4 43.88	.31	.04	46 4 44.08	28.978	307 45 25.69	79 18 54.83	
58	99 245	2	45 20 20.22	-1.02	-.15	45 20 19.09	29.612	307 1 .70	77 57 56.78	
59	99 94	3	0 0 .00	-.11	-.03	0 0 .00	52.349	336 0 19.42	89 33 19.51	JLL 11/03/03 T-2000
60	99 260	3	330 5 4.50	-.02	.00	330 5 4.59	30.371	306 5 24.01	77 5 1.48	
61	99 275	3	329 3 15.68	.41	.06	329 3 16.19	31.194	305 3 35.61	76 42 .93	
62	99 290	3	328 0 7.95	.00	.00	328 0 8.06	32.026	304 0 27.48	76 48 19.72	
63	99 2120	3	326 7 14.20	-.09	-.01	326 7 14.22	33.495	302 7 33.63	78 17 25.67	
64	94 96	3	0 0 .00	.68	.17	0 0 .00	53.415	254 15 49.68	91 11 24.33	NNP 11/03/03 T-3000
65	94 215	3	287 19 36.90	.12	.02	287 19 36.34	30.666	181 35 26.02	82 26 21.71	
66	94 230	3	288 2 47.15	.28	.04	288 2 46.75	30.815	182 18 36.43	80 43 32.50	
67	94 245	3	289 11 45.50	-2.24	-.33	289 11 42.58	30.985	183 27 32.26	79 16 21.05	
68	94 260	3	290 41 28.30	-.08	-.01	290 41 27.54	31.161	184 57 17.22	78 10 52.33	
69	96 50	2	0 0 .00	-.97	-.20	0 0 .00	44.054	180 27 37.75	87 56 29.06	NNP 11/03/03 T-3000
70	96 275	2	287 55 29.52	1.46	.35	287 55 31.95	51.026	108 23 9.70	81 7 3.28	
71	96 290	2	288 17 19.15	.86	.20	288 17 20.98	50.112	108 44 58.72	80 47 56.30	
72	96 2105	2	288 39 51.75	.68	.16	288 39 53.40	49.164	109 7 31.15	80 46 16.49	
73	96 2120	2	289 1 55.75	-.13	-.03	289 1 56.59	48.232	109 29 34.33	81 3 13.05	
74	96 2150	2	289 36 53.45	-1.09	-.24	289 36 53.33	46.712	110 4 31.08	82 30 24.37	
75	96 2165	2	289 46 50.52	-1.39	-.30	289 46 50.10	46.239	110 14 27.84	83 35 31.09	

76	50	96	2	0	0	.00	-.28	-.06	0	0	.00	44.054	0	27	37.74	92	3	32.36 NNP 11/03/03
77	50	260	2	59	44	55.48	-1.07	-.28	59	44	54.69	56.910	60	12	32.44	84	2	26.02
78	50	275	2	59	16	28.62	-1.30	-.34	59	16	27.60	56.154	59	44	5.35	83	33	44.46
79	50	290	2	58	44	56.22	-.96	-.25	58	44	55.54	55.315	59	12	33.29	83	19	28.24
80	50	2105	2	58	12	32.98	-.72	-.18	58	12	32.54	54.456	58	40	10.28	83	21	15.98
81	50	2120	2	57	41	8.38	.00	.00	57	41	8.66	53.621	58	8	46.40	83	39	49.68
82	50	2150	2	56	51	45.48	1.85	.46	56	51	47.62	52.293	57	19	25.36	85	3	12.77
83	50	2165	2	56	37	53.80	2.96	.72	56	37	57.04	51.897	57	5	34.79	86	2	48.01

ADJUSTED DATA: GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	REF/KM	V	N.V	ADJUSTED	DIST.	AZ.	
84	94	115	-1	81 31 8.59	.00	1.51	.19	81 31 10.09	27.339	189 42 43.78	JLL 10/31/03
85	94	130	-1	79 43 58.02	.00	.36	.05	79 43 58.37	27.863	189 34 40.53	
86	94	145	-1	78 22 9.24	.00	-1.34	-.18	78 22 7.90	28.608	189 22 12.30	
87	94	160	-1	77 30 26.97	.00	1.01	.14	77 30 27.98	29.504	189 6 50.49	
88	94	175	-1	77 10 12.58	.00	-1.85	-.26	77 10 10.73	30.483	188 49 51.84	
89	94	190	-1	77 19 44.27	.00	.17	.02	77 19 44.43	31.474	188 32 41.38	
90	94	1105	-1	77 56 6.17	.00	2.21	.33	77 56 8.38	32.414	188 16 38.95	JLL 10/31/03
91	99	145	-1	79 20 32.06	.00	-17.69	-.94	79 20 14.37	33.368	307 58 30.10	" "
92	99	160	-1	78 8 21.17	.00	-17.43	-.92	78 8 3.74	33.015	306 51 42.52	
93	99	175	-1	77 16 24.66	.00	-14.69	-.76	77 16 9.98	32.562	305 31 22.86	
94	99	190	-1	76 48 55.60	.00	-20.03	-1.02	76 48 35.57	32.037	304 1 53.94	
95	99	1105	-1	76 49 1.95	.00	-21.33	-1.07	76 48 40.62	31.474	302 28 50.13	
96	99	1120	-1	77 18 6.37	.00	-17.28	-.85	77 17 49.10	30.913	300 59 22.94	
97	99	1135	-1	78 15 25.07	.00	-19.98	-.97	78 15 5.09	30.388	299 40 10.80	
98	99	1150	-1	79 38 16.38	.00	-20.49	-.98	79 37 55.89	29.940	298 37 41.53	
99	99	1165	-1	81 20 38.21	.00	-21.94	-1.04	81 20 16.27	29.607	297 57 47.19	JLL 10/31/03
100	96	115	-1	83 56 14.16	.00	-2.56	-.55	83 56 11.60	48.668	104 33 44.07	NNP 10/31/03
101	96	130	-1	82 51 35.20	.00	-2.51	-.54	82 51 32.69	48.872	104 59 59.06	
102	96	145	-1	81 57 18.97	.00	.24	.05	81 57 19.21	49.138	105 41 44.18	
103	96	160	-1	81 17 11.62	.00	-1.40	-.30	81 17 10.22	49.446	106 35 37.89	
104	96	175	-1	80 53 35.06	.00	.34	.07	80 53 35.40	49.775	107 37 48.31	
105	96	190	-1	80 47 50.83	.00	-.45	-.10	80 47 50.39	50.104	108 43 53.36	
106	96	1105	-1	81 0 9.42	.00	-1.37	-.30	81 0 8.05	50.409	109 49 19.45	
107	96	1120	-1	81 29 15.88	.00	-.73	-.16	81 29 15.15	50.669	110 49 20.18	
108	96	1135	-1	82 12 56.18	.00	-.24	-.05	82 12 55.93	50.870	111 40 19.03	
109	96	1150	-1	83 8 26.41	.00	-.38	-.08	83 8 26.03	50.998	112 19 11.59	
110	96	1165	-1	84 11 44.86	.00	-.02	.00	84 11 44.84	51.041	112 43 25.30	" "
111	50	115	-1	86 25 17.38	.00	10.35	.94	86 25 27.74	57.051	55 58 50.59	NNP 10/31/03
112	50	130	-1	85 28 3.73	.00	14.81	1.34	85 28 18.54	56.904	56 18 2.74	
113	50	145	-1	84 37 57.40	.00	14.72	1.32	84 38 12.12	56.637	56 49 4.05	
114	50	160	-1	83 58 6.65	.00	15.05	1.34	83 58 21.70	56.268	57 29 57.09	
115	50	175	-1	83 31 12.74	.00	14.78	1.31	83 31 27.52	55.821	58 18 25.72	
116	50	190	-1	83 19 16.66	.00	13.83	1.21	83 19 30.50	55.322	59 11 32.92	
117	50	1105	-1	83 23 41.36	.00	10.76	.94	83 23 52.11	54.804	60 5 47.03	
118	50	1120	-1	83 44 24.17	.00	14.93	1.29	83 44 39.10	54.306	60 57 4.11	
119	50	1135	-1	84 20 28.52	.00	13.01	1.11	84 20 41.53	53.862	61 41 56.24	

120	50	1150	-1	85	9	44.43	.00	14.23	1.21	85	9	58.66	53.501	62 16 56.08	
121	50	1165	-1	86	8	33.76	.00	12.48	1.06	86	8	46.24	53.251	62 39 .57	
122	94	275	-1	77	31	22.42	.00	-.73	-.11	77	31	21.69	31.333	186 41 10.87	JLL 11/03/03
123	94	290	-1	77	20	10.13	.00	-.30	-.04	77	20	9.83	31.491	188 32 8.69	
124	94	2105	-1	77	37	37.47	.00	-.39	-.06	77	37	37.07	31.621	190 21 31.25	
125	94	2120	-1	78	22	29.09	.00	.91	.13	78	22	30.00	31.718	192 3 18.96	
126	94	2150	-1	80	58	55.66	.00	-3.00	-.44	80	58	52.66	31.785	194 34 55.00	
127	94	2165	-1	82	40	9.17	.00	-.83	-.12	82	40	8.33	31.752	195 15 44.95	
128	95	245	-1	89	2	21.22	.00	-1.20	-.43	89	2	20.01	106.048	41 36 30.96	JLL 11/03/03
129	95	260	-1	88	42	4.11	.00	-2.87	-1.03	88	42	1.24	105.534	41 17 3.04	
130	95	2165	-1	89	57	54.02	.00	-1.54	-.54	89	57	52.48	101.868	38 53 28.47	
131	99	215	-1	81	2	35.25	.00	-5.21	-.24	81	2	30.03	28.522	308 13 57.18	JLL 11/03/03
132	99	230	-1	79	19	4.60	.00	-9.78	-.45	79	18	54.83	28.978	307 45 25.69	
133	99	245	-1	77	58	3.20	.00	-6.42	-.30	77	57	56.78	29.612	307 1 .70	

ADJUSTED DATA: GROUPED VERTICAL ANGLES

	FROM	TO	LIST	OBSERVED	REF/KM	V	N.V	ADJUSTED	DIST.	AZ.	
134	99	260	-1	77 5 5.66	.00	-4.17	-.20	77 5 1.48	30.371	306 5 24.01	
135	99	275	-1	76 42 6.80	.00	-5.87	-.29	76 42 .93	31.194	305 3 35.61	
136	99	290	-1	76 48 25.33	.00	-5.61	-.29	76 48 19.72	32.026	304 0 27.48	
137	99	2120	-1	78 17 26.21	.00	-.54	-.03	78 17 25.67	33.495	302 7 33.63	
138	94	215	-1	82 26 21.13	.00	.58	.08	82 26 21.71	30.666	181 35 26.02	NNP 11/03/03
139	94	230	-1	80 43 31.40	.00	1.10	.16	80 43 32.50	30.815	182 18 36.43	
140	94	245	-1	79 16 18.10	.00	2.95	.42	79 16 21.05	30.985	183 27 32.26	
141	94	260	-1	78 10 48.01	.00	4.33	.63	78 10 52.33	31.161	184 57 17.22	
142	96	275	-1	81 7 3.05	.00	.23	.05	81 7 3.28	51.026	108 23 9.70	
143	96	290	-1	80 47 56.27	.00	.03	.01	80 47 56.30	50.112	108 44 58.72	
144	96	2105	-1	80 46 16.87	.00	-.37	-.08	80 46 16.49	49.164	109 7 31.15	
145	96	2120	-1	81 3 14.12	.00	-1.07	-.23	81 3 13.05	48.232	109 29 34.33	
146	96	2150	-1	82 30 22.92	.00	1.46	.30	82 30 24.37	46.712	110 4 31.08	
147	96	2165	-1	83 35 29.04	.00	2.05	.42	83 35 31.09	46.239	110 14 27.84	
148	50	260	-1	84 2 19.38	.00	6.63	.60	84 2 26.02	56.910	60 12 32.44	NNP 11/03/03
149	50	275	-1	83 33 39.33	.00	5.13	.46	83 33 44.46	56.154	59 44 5.35	
150	50	290	-1	83 19 23.75	.00	4.49	.39	83 19 28.24	55.315	59 12 33.29	
151	50	2105	-1	83 21 11.54	.00	4.45	.38	83 21 15.98	54.456	58 40 10.28	
152	50	2120	-1	83 39 46.54	.00	3.15	.27	83 39 49.68	53.621	58 8 46.40	
153	50	2150	-1	85 3 7.41	.00	5.36	.45	85 3 12.77	52.293	57 19 25.36	
154	50	2165	-1	86 2 43.59	.00	4.41	.36	86 2 48.01	51.897	57 5 34.79	

ADJUSTED ELEVATION DIFFERENCES

	FROM	TO	MEASURED	V	N.V	ADJUSTED	E L E V A T I O N S
155	42	99	-.3884	.0005	.47	-.3879	HAVAGO GGAO03A2
156	99	94	.4070	-.0006	-.59	.4064	HAVAGO GGAO03A2
157	42	94	.0186	-.0001	-.12	.0185	" "

158	42	96	-1.0906	-.0001	-.11	-1.0907	"	"
159	99	50	.8818	-.0019	-1.93	.8799	"	"
160	94	96	-1.1092	.0000	.01	-1.1092	"	"
161	50	96	-1.5840	.0013	1.35	-1.5827	"	"
162	95	96	-5.0970	.0000	-.02	-5.0970	"	"
163	50	95	3.5130	.0014	1.37	3.5144	"	"

ADJUSTED POSITION DIFFERENCES (METERS)

	FROM	TO	LAT.	V	LON.	V	H	V	
164	2001	2000	.0030	.0000	-.0051	.0000	-.2270	.0000	CFIT 03 JLL

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD HAVAGO VERSION 90.07.18 DATE: 06-12-** TIME: 14:31:00 PAGE 16

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

STATION				OBSERVED	V	N.V	ADJUSTED	SIGMA	
193	42	7108	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
194	42	7108	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
195	50	JPL 4005 WEST	LAT	39 1 18.02	-1.63	-.16	39 1 16.39	.24	NOT OBS.
196	50	JPL 4005 WEST	LON	76 49 37.51	-8.13	-.54	76 49 29.38	.31	NOT OBS.
197	94	GGAO VLBI RM PIER A	LAT	39 1 18.24	.04	.15	39 1 18.28	.23	
198	94	GGAO VLBI RM PIER A	LON	76 49 27.09	.14	.36	76 49 27.23	.30	
199	95	GGAO VLBI RM PIER B	LAT	39 1 16.36	-1.64	-.16	39 1 14.72	.24	NOT OBS.
200	95	GGAO VLBI RM PIER B	LON	76 49 38.36	-8.12	-.54	76 49 30.24	.31	NOT OBS.
201	96	GGAO VLBI RM PIER C	LAT	39 1 19.45	-1.64	-.16	39 1 17.81	.24	NOT OBS.
202	96	GGAO VLBI RM PIER C	LON	76 49 37.50	-8.12	-.54	76 49 29.37	.31	NOT OBS.
203	99	7108 RM-1	LAT	39 1 18.37	-1.64	-.16	39 1 16.73	.24	NOT OBS.
204	99	7108 RM-1	LON	76 49 34.48	-8.13	-.54	76 49 26.35	.31	NOT OBS.
205	2001	MV-3 (PRELIMINARY)	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
206	2001	MV-3 (PRELIMINARY)	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
207	2000	MV-3 VLBI ANTENNA	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
208	2000	MV-3 VLBI ANTENNA	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
209	115	AZ 0, EL 15 DEGREE	LAT	39 1 19.05	-1.63	-.16	39 1 17.42	.24	NOT OBS.
210	115	AZ 0, EL 15 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
211	130	AZ 0, EL 30 DEGREE	LAT	39 1 19.04	-1.63	-.16	39 1 17.41	.24	NOT OBS.
212	130	AZ 0, EL 30 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
213	145	AZ 0, EL 45 DEGREE	LAT	39 1 19.02	-1.63	-.16	39 1 17.39	.24	NOT OBS.
214	145	AZ 0, EL 45 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.

215	160	AZ 0, EL 60 DEGREE	LAT	39 1 19.00	-1.63	-.16	39 1 17.36	.24	NOT OBS.
216	160	AZ 0, EL 60 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
217	175	AZ 0, EL 75 DEGREE	LAT	39 1 18.97	-1.63	-.16	39 1 17.33	.24	NOT OBS.
218	175	AZ 0, EL 75 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
219	190	AZ 0, EL 90 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
220	190	AZ 0, EL 90 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
221	1105	AZ 0, EL 105 DEGREE	LAT	39 1 18.90	-1.63	-.16	39 1 17.27	.24	NOT OBS.
222	1105	AZ 0, EL 105 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
223	1120	AZ 0, EL 120 DEGREE	LAT	39 1 18.87	-1.63	-.16	39 1 17.24	.24	NOT OBS.
224	1120	AZ 0, EL 120 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
225	1135	AZ 0, EL 135 DEGREE	LAT	39 1 18.85	-1.63	-.16	39 1 17.21	.24	NOT OBS.
226	1135	AZ 0, EL 135 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

STATION				OBSERVED	V	N.V	ADJUSTED	SIGMA	
227	1150	AZ 0, EL 150 DEGREE	LAT	39 1 18.83	-1.63	-.16	39 1 17.19	.24	NOT OBS.
228	1150	AZ 0, EL 150 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
229	1165	AZ 0, EL 165 DEGREE	LAT	39 1 18.81	-1.63	-.16	39 1 17.18	.24	NOT OBS.
230	1165	AZ 0, EL 165 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
231	215	AZ 90, EL 15 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
232	215	AZ 90, EL 15 DEGREE	LON	76 49 35.40	-8.13	-.54	76 49 27.27	.31	NOT OBS.
233	230	AZ 90, EL 30 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
234	230	AZ 90, EL 30 DEGREE	LON	76 49 35.41	-8.13	-.54	76 49 27.28	.31	NOT OBS.
235	245	AZ 90, EL 45 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
236	245	AZ 90, EL 45 DEGREE	LON	76 49 35.44	-8.13	-.54	76 49 27.31	.31	NOT OBS.
237	260	AZ 90, EL 60 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
238	260	AZ 90, EL 60 DEGREE	LON	76 49 35.47	-8.13	-.54	76 49 27.34	.31	NOT OBS.
239	275	AZ 90, EL 75 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
240	275	AZ 90, EL 75 DEGREE	LON	76 49 35.51	-8.13	-.54	76 49 27.38	.31	NOT OBS.
241	290	AZ 90, EL 90 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
242	290	AZ 90, EL 90 DEGREE	LON	76 49 35.55	-8.13	-.54	76 49 27.42	.31	NOT OBS.
243	2105	AZ 90, EL 105 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
244	2105	AZ 90, EL 105 DEGREE	LON	76 49 35.59	-8.13	-.54	76 49 27.46	.31	NOT OBS.

245	2120	AZ 90, EL 120 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
246	2120	AZ 90, EL 120 DEGREE	LON	76 49 35.63	-8.13	-.54	76 49 27.50	.31	NOT OBS.
247	2150	AZ 90, EL 150 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
248	2150	AZ 90, EL 150 DEGREE	LON	76 49 35.69	-8.13	-.54	76 49 27.56	.31	NOT OBS.
249	2165	AZ 90, EL 165 DEGREE	LAT	39 1 18.93	-1.63	-.16	39 1 17.30	.24	NOT OBS.
250	2165	AZ 90, EL 165 DEGREE	LON	76 49 35.71	-8.13	-.54	76 49 27.58	.31	NOT OBS.

GEODETIC LATITUDE CONSTRAINTS

STATION		CONSTRAINED	V	N.V	ADJUSTED	SIGMA
251	42	39 1 18.93304	.00000	.00000	39 1 18.93304	.00003
252	50	39 1 18.02097	.00001	.20817	39 1 18.02098	.00002
253	94	39 1 19.91830	.00001	.28776	39 1 19.91831	.00002
254	95	39 1 16.36195	.00000	-.07312	39 1 16.36195	.00002
255	96	39 1 19.44860	-.00001	-.22491	39 1 19.44859	.00002
256	99	39 1 18.36752	-.00001	-.19789	39 1 18.36751	.00002
257	2001	39 1 18.93311	.00000	.00000	39 1 18.93311	.00003

GEODETIC LONGITUDE CONSTRAINTS

STATION		CONSTRAINED	V	N.V	ADJUSTED	SIGMA
258	42	76 49 35.55077	.00000	.00000	76 49 35.55077	.00003
259	50	76 49 37.51232	.00001	.12783	76 49 37.51233	.00002
260	94	76 49 35.36085	.00000	.01384	76 49 35.36085	.00003
261	95	76 49 38.36408	.00000	-.06185	76 49 38.36408	.00003
262	96	76 49 37.49767	-.00001	-.14935	76 49 37.49766	.00003
263	99	76 49 34.47588	.00000	.06955	76 49 34.47588	.00003
264	2001	76 49 35.55097	.00000	.00000	76 49 35.55097	.00003

GEODETIC HEIGHT CONSTRAINTS

STATION		CONSTRAINED	V	N.V	ADJUSTED	SIGMA
265	42	13.7450	.0002	.2	13.7452	.000
266	50	14.2390	-.0006	-.6	14.2384	.000
267	94	13.7640	-.0002	-.2	13.7638	.000
268	95	17.7530	.0000	.0	17.7530	.000
269	96	12.6560	.0001	.1	12.6561	.000
270	99	13.3560	.0004	.4	13.3564	.000
271	2001	17.0410	.0000	.0	17.0410	.001

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD HAVAGO VERSION 90.07.18 DATE: 06-12-** TIME: 14:31:00 PAGE 19

ADJUSTED CARTESIAN COORDINATES

DX	DY	DZ	EPSILON	PSI	OMEGA	SCALE
.000	.000	.000	.000	.000	.000	.000

STATION		X	Y	Z	TRANSFORMED COORDINATES X	Y	Z
42	7108	1130794.761	-4831233.817	3994217.045			
50	JPL 4005 WEST	1130752.940	-4831262.186	3994195.504			
94	GGAO VLBI RM PIER A	1130794.853	-4831214.163	3994240.661			
95	GGAO VLBI RM PIER B	1130740.952	-4831300.878	3994157.969			
96	GGAO VLBI RM PIER C	1130746.686	-4831233.919	3994228.711			
99	7108 RM-1	1130822.371	-4831238.321	3994203.251			
2001	MV-3 (PRELIMINARY)	1130795.340	-4831236.309	3994219.121			
2000	MV-3 VLBI ANTENNA	1130795.304	-4831236.135	3994218.981			
115	AZ 0, EL 15 DEGREE	1130794.951	-4831234.591	3994222.494			
130	AZ 0, EL 30 DEGREE	1130795.171	-4831235.533	3994222.785			
145	AZ 0, EL 45 DEGREE	1130795.400	-4831236.514	3994222.814			
160	AZ 0, EL 60 DEGREE	1130795.622	-4831237.467	3994222.583			
175	AZ 0, EL 75 DEGREE	1130795.824	-4831238.328	3994222.106			
190	AZ 0, EL 90 DEGREE	1130795.991	-4831239.042	3994221.416			
1105	AZ 0, EL 105 DEGREE	1130796.111	-4831239.557	3994220.557			
1120	AZ 0, EL 120 DEGREE	1130796.176	-4831239.837	3994219.594			
1135	AZ 0, EL 135 DEGREE	1130796.183	-4831239.866	3994218.588			
1150	AZ 0, EL 150 DEGREE	1130796.130	-4831239.639	3994217.606			
1165	AZ 0, EL 165 DEGREE	1130796.020	-4831239.173	3994216.721			
215	AZ 90, EL 15 DEGREE	1130799.107	-4831236.036	3994219.593			
230	AZ 90, EL 30 DEGREE	1130798.900	-4831236.828	3994220.180			
245	AZ 90, EL 45 DEGREE	1130798.447	-4831237.573	3994220.684			
260	AZ 90, EL 60 DEGREE	1130797.779	-4831238.219	3994221.072			
275	AZ 90, EL 75 DEGREE	1130796.944	-4831238.723	3994221.317			
290	AZ 90, EL 90 DEGREE	1130795.996	-4831239.052	3994221.402			
2105	AZ 90, EL 105 DEGREE	1130795.006	-4831239.180	3994221.323			
2120	AZ 90, EL 120 DEGREE	1130794.027	-4831239.102	3994221.081			
2150	AZ 90, EL 150 DEGREE	1130792.400	-4831238.358	3994220.195			
2165	AZ 90, EL 165 DEGREE	1130791.859	-4831237.742	3994219.609			

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD DATE: 06-12-** TIME: 14:31:00 PAGE 20

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO	STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.	STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
42	2000	AZ.*******	1.00	.00	.00	DX .0013	1.00	.03	-.02	.5429	2 9 20.65	3 12 19.61
		DIST. .0012	.00	1.00	.00	DY .0013	.03	1.00	.11	-2.3182	3.0688	.0052
		V.A. 89.77	.00	.00	1.00	DZ .0013	-.02	.11	1.00	1.9361	0 5 48.62	183 12 19.61

2001	2000	AZ.*******	1.00	.00	.00	DX	.0008	1.00	.00	.00	-.0357	59	35	5.86	59	32	3.64
		DIST. .0008	.00	1.00	.00	DY	.0008	.00	1.00	.00	.1747			.2271			.0059
		V.A.700.44	.00	.00	1.00	DZ	.0008	.00	.00	1.00	-.1406	178	30	20.14	239	32	3.64
2001	115	AZ. 67.97	1.00	.09	-.01	DX	.0012	1.00	.08	.04	-.3892	0	11	43.84	0	11	40.00
		DIST. .0012	.09	1.00	-.11	DY	.0012	.08	1.00	.21	1.7183			3.8048			3.7292
		V.A. 56.42	-.01	-.11	1.00	DZ	.0011	.04	.21	1.00	3.3723	78	33	43.94	180	11	40.00
2001	130	AZ. 75.56	1.00	.08	-.03	DX	.0012	1.00	.07	.03	-.1691	0	12	46.02	0	12	44.08
		DIST. .0012	.08	1.00	-.18	DY	.0012	.07	1.00	.20	.7768			3.7488			3.3467
		V.A. 60.17	-.03	-.18	1.00	DZ	.0011	.03	.20	1.00	3.6635	63	13	15.10	180	12	44.09
2001	145	AZ. 87.87	1.00	-.01	.04	DX	.0012	1.00	-.01	-.04	.0605	0	15	26.76	0	15	27.40
		DIST. .0011	-.01	1.00	-.15	DY	.0011	-.01	1.00	.14	-.2044			3.6989			2.7350
		V.A. 62.03	.04	-.15	1.00	DZ	.0011	-.04	.14	1.00	3.6928	47	40	48.72	180	15	27.40
2001	160	AZ. 124.33	1.00	.00	.04	DX	.0012	1.00	-.01	-.04	.2827	0	20	20.05	0	20	25.05
		DIST. .0010	.00	1.00	-.11	DY	.0011	-.01	1.00	.14	-1.1571			3.6607			1.9393
		V.A. 64.80	.04	-.11	1.00	DZ	.0011	-.04	.14	1.00	3.4615	31	59	25.50	180	20	25.05
2001	175	AZ. 239.44	1.00	.01	.05	DX	.0012	1.00	-.02	-.05	.4842	0	38	33.24	0	38	49.96
		DIST. .0010	.01	1.00	-.03	DY	.0011	-.02	1.00	.13	-2.0186			3.6356			1.0119
		V.A. 66.23	.05	-.03	1.00	DZ	.0011	-.05	.13	1.00	2.9847	16	9	41.14	180	38	49.96
2001	190	AZ.*******	1.00	.05	-.01	DX	.0012	1.00	-.02	-.05	.6515	39	8	33.23	39	27	54.50
		DIST. .0010	.05	1.00	.02	DY	.0011	-.02	1.00	.13	-2.7321			3.6268			.0184
		V.A. 64.93	-.01	.02	1.00	DZ	.0011	-.05	.13	1.00	2.2945	0	17	25.36	219	27	54.50
2001	1105	AZ. 248.59	1.00	-.05	.05	DX	.0012	1.00	-.02	-.05	.7715	179	22	9.66	179	21	42.22
		DIST. .0010	-.05	1.00	-.11	DY	.0011	-.02	1.00	.13	-3.2478			3.6339			.9862
		V.A. 64.58	.05	-.11	1.00	DZ	.0011	-.05	.13	1.00	1.4360	15	44	47.81	359	21	42.22
2001	1120	AZ. 160.85	1.00	-.14	.08	DX	.0015	1.00	-.03	-.06	.8360	179	42	10.87	179	41	55.50
		DIST. .0012	-.14	1.00	-.03	DY	.0011	-.03	1.00	.01	-3.5277			3.6561			1.9157
		V.A. 65.03	.08	-.03	1.00	DZ	.0011	-.06	.01	1.00	.4724	31	35	54.87	359	41	55.50
2001	1135	AZ. 115.20	1.00	-.16	.04	DX	.0015	1.00	-.02	-.06	.8434	179	46	39.86	179	46	28.93
		DIST. .0012	-.16	1.00	-.01	DY	.0011	-.02	1.00	.00	-3.5564			3.6938			2.7155
		V.A. 63.85	.04	-.01	1.00	DZ	.0011	-.06	.00	1.00	-.5332	47	19	15.83	359	46	28.93
2001	1150	AZ. 95.10	1.00	-.16	.01	DX	.0016	1.00	-.01	-.07	.7905	179	48	50.53	179	48	42.19
		DIST. .0012	-.16	1.00	.00	DY	.0011	-.01	1.00	.00	-3.3295			3.7425			3.3318
		V.A. 62.84	.01	.00	1.00	DZ	.0011	-.07	.00	1.00	-1.5152	62	54	17.44	359	48	42.19

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

FROM	TO		STANDARD ERRORS	CORRELATION COEFF. AZ.	DIST.	V.A.		STANDARD ERRORS	CORRELATION COEFF. DX	DY	DZ	DX,DY,DZ	AZ.,DIST.,V.A.	AZ.,DIST.,B.AZ. (GEODETIC)
2001	1165	AZ.	86.00	1.00	-.15	-.03	DX	.0016	1.00	.01	-.08	.6799	179 51 27.67	179 51 21.24
		DIST.	.0012	-.15	1.00	.01	DY	.0011	.01	1.00	.00	-2.8637	3.7980	3.7180
		V.A.	61.99	-.03	.01	1.00	DZ	.0011	-.08	.00	1.00	-2.4003	78 13 7.11	359 51 21.24
2001	215	AZ.	91.19	1.00	.36	.02	DX	.0014	1.00	-.30	-.35	3.7674	90 6 11.91	90 6 7.13
		DIST.	.0013	.36	1.00	.00	DY	.0013	-.30	1.00	.30	.2730	3.8067	3.7305
		V.A.	62.33	.02	.00	1.00	DZ	.0014	-.35	.30	1.00	.4719	78 31 5.77	270 6 7.23
2001	230	AZ.	99.67	1.00	.35	-.06	DX	.0014	1.00	-.29	-.33	3.5603	90 6 40.92	90 6 36.62
		DIST.	.0013	.35	1.00	-.05	DY	.0014	-.29	1.00	.29	-.5184	3.7503	3.3485
		V.A.	63.88	-.06	-.05	1.00	DZ	.0014	-.33	.29	1.00	1.0584	63 13 56.03	270 6 36.71
2001	245	AZ.	101.66	1.00	.15	-.05	DX	.0012	1.00	-.12	-.16	3.1074	90 8 21.54	90 8 17.90
		DIST.	.0011	.15	1.00	-.10	DY	.0012	-.12	1.00	.22	-1.2639	3.7007	2.7376
		V.A.	61.65	-.05	-.10	1.00	DZ	.0012	-.16	.22	1.00	1.5627	47 42 28.28	270 8 17.97
2001	260	AZ.	124.88	1.00	.00	.07	DX	.0012	1.00	.05	.02	2.4395	90 8 53.95	90 8 51.42
		DIST.	.0011	.00	1.00	-.10	DY	.0011	.05	1.00	.13	-1.9098	3.6613	1.9401
		V.A.	63.97	.07	-.10	1.00	DZ	.0011	.02	.13	1.00	1.9511	31 59 46.40	270 8 51.47
2001	275	AZ.	236.37	1.00	.05	-.02	DX	.0012	1.00	-.02	-.04	1.6046	90 13 48.53	90 13 48.96
		DIST.	.0010	.05	1.00	-.09	DY	.0011	-.02	1.00	.13	-2.4137	3.6362	1.0123
		V.A.	64.48	-.02	-.09	1.00	DZ	.0011	-.04	.13	1.00	2.1958	16 9 43.93	270 13 48.99
2001	290	AZ.	*******	1.00	.04	-.02	DX	.0012	1.00	-.01	-.03	.6562	102 28 59.55	102 29 52.95
		DIST.	.0010	.04	1.00	-.04	DY	.0011	-.01	1.00	.13	-2.7421	3.6266	.0144
		V.A.	66.00	-.02	-.04	1.00	DZ	.0011	-.03	.13	1.00	2.2810	0 13 30.98	282 29 52.95
2001	2105	AZ.	259.91	1.00	-.08	.08	DX	.0012	1.00	.07	.05	-.3338	269 53 20.78	269 53 9.78
		DIST.	.0010	-.08	1.00	-.06	DY	.0012	.07	1.00	.20	-2.8708	3.6329	.9793
		V.A.	68.24	.08	-.06	1.00	DZ	.0011	.05	.20	1.00	2.2012	15 38 25.24	89 53 9.76
2001	2120	AZ.	123.44	1.00	-.03	-.02	DX	.0012	1.00	.01	-.01	-1.3123	269 57 53.31	269 57 45.52
		DIST.	.0010	-.03	1.00	-.11	DY	.0011	.01	1.00	.12	-2.7928	3.6555	1.9142
		V.A.	64.00	-.02	-.11	1.00	DZ	.0011	-.01	.12	1.00	1.9598	31 34 47.01	89 57 45.47
2001	2150	AZ.	75.99	1.00	-.13	.03	DX	.0012	1.00	.10	.07	-2.9396	270 0 15.19	270 0 9.24
		DIST.	.0012	-.13	1.00	-.15	DY	.0012	.10	1.00	.20	-2.0487	3.7405	3.3291
		V.A.	59.26	.03	-.15	1.00	DZ	.0011	.07	.20	1.00	1.0739	62 52 34.88	90 0 9.15
2001	2165	AZ.	67.46	1.00	-.17	.02	DX	.0011	1.00	.13	.10	-3.4808	269 59 58.80	269 59 53.34
		DIST.	.0012	-.17	1.00	-.08	DY	.0011	.13	1.00	.23	-1.4327	3.7956	3.7157
		V.A.	53.93	.02	-.08	1.00	DZ	.0011	.10	.23	1.00	.4875	78 13 40.90	89 59 53.24

MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

		E Q U A T O R I A L S Y S T E M			HORIZON SYSTEM, ORIGIN AT THE STANDPOINT					
FROM	TO	ALTITUDE	AZIMUTH	DISTANCE	DN	SIGMA	DE	SIGMA	DU	SIGMA
42	2000	39 7 5.67	283 10 49.48	3.0688	.0052	.0013	.0002	.0013	3.0688	.0012
2001	2000	38 15 12.08	101 32 4.38	.2271	.0030	.0008	.0051	.0008	-.2270	.0008
2001	115	62 24 56.78	102 45 42.76	3.8048	3.7292	.0012	.0127	.0012	.7545	.0010
2001	130	77 45 22.95	102 16 47.75	3.7488	3.3467	.0012	.0124	.0012	1.6890	.0010
2001	145	86 41 45.25	286 28 48.46	3.6989	2.7350	.0012	.0123	.0012	2.4904	.0010
2001	160	71 0 38.24	283 43 38.98	3.6607	1.9393	.0012	.0115	.0012	3.1048	.0010
2001	175	55 10 53.53	283 29 20.23	3.6356	1.0119	.0012	.0113	.0012	3.4920	.0010
2001	190	39 14 47.20	283 24 44.67	3.6268	.0143	.0012	.0116	.0012	3.6268	.0010
2001	1105	23 16 32.36	283 21 43.28	3.6339	-.9861	.0012	.0109	.0012	3.4976	.0010
2001	1120	7 25 23.56	283 19 57.50	3.6561	-1.9156	.0012	.0099	.0015	3.1140	.0012
2001	1135	8 17 57.63	283 20 27.03	3.6938	-2.7155	.0012	.0105	.0015	2.5040	.0012
2001	1150	23 52 59.32	283 21 24.38	3.7425	-3.3317	.0012	.0108	.0015	1.7046	.0011
2001	1165	39 11 49.19	283 21 19.74	3.7980	-3.7179	.0012	.0092	.0016	.7755	.0011
2001	215	7 7 13.45	4 8 40.46	3.8067	-.0067	.0016	3.7305	.0013	.7577	.0012
2001	230	16 23 32.44	351 42 53.46	3.7503	-.0065	.0016	3.3484	.0013	1.6890	.0012
2001	245	24 58 41.93	337 52 .62	3.7007	-.0067	.0013	2.7375	.0012	2.4903	.0011
2001	260	32 12 5.12	321 56 40.63	3.6613	-.0050	.0012	1.9400	.0012	3.1051	.0010
2001	275	37 8 48.44	303 36 53.85	3.6362	-.0041	.0012	1.0122	.0012	3.4925	.0010
2001	290	38 58 20.77	283 27 31.05	3.6266	-.0031	.0012	.0139	.0012	3.6266	.0010
2001	2105	37 17 35.41	263 22 .62	3.6329	-.0019	.0012	-.9794	.0012	3.4984	.0010
2001	2120	32 25 12.60	244 49 55.43	3.6555	-.0012	.0011	-1.9143	.0012	3.1142	.0010
2001	2150	16 41 3.59	214 52 28.11	3.7405	.0002	.0012	-3.3292	.0012	1.7054	.0010
2001	2165	7 22 47.53	202 22 22.01	3.7956	.0000	.0012	-3.7157	.0012	.7744	.0010

F.1.8 2003 Survey Circle Fit Output for North Quadrant and East Quadrant

2003 Survey North Quadrant

Circle Radius: 3.8535202e+00
Circle Center: (3.0117619e-03, -2.2705545e-01)

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	3.7292000	0.7545000	0.0002118	0.0000558	-0.0002190
2	3.3467000	1.6890000	-0.0002141	-0.0001227	0.0002468
3	2.7350000	2.4904000	0.0001190	0.0001184	-0.0001679
4	1.9393000	3.1048000	-0.0000558	-0.0000959	0.0001110
5	1.0119000	3.4920000	0.0000132	0.0000487	-0.0000504
6	0.0143000	3.6268000	-0.0000010	-0.0003518	0.0003518
7	-0.9861000	3.4976000	0.0000594	-0.0002236	0.0002313
8	-1.9156000	3.1140000	-0.0003809	0.0006634	-0.0007650
9	-2.7155000	2.5040000	-0.0000593	0.0000595	-0.0000840
10	-3.3317000	1.7046000	0.0002220	-0.0001286	0.0002566
11	-3.7179000	0.7755000	0.0000857	-0.0000231	0.0000888

RADIUS = 3.8535 m
DN = +0.0030 m
DU = -0.2271 m

2003 Survey East Quadrant

Circle Radius: 3.8533908e+00
Circle Center: (5.0692316e-03, -2.2698014e-01)

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	3.7305000	0.7577000	0.0000240	0.0000063	-0.0000248
2	3.3484000	1.6890000	-0.0000248	-0.0000142	0.0000285
3	2.7375000	2.4903000	-0.0001075	-0.0001069	0.0001516
4	1.9400000	3.1051000	0.0001242	0.0002138	-0.0002473
5	1.0122000	3.4925000	-0.0000076	-0.0000281	0.0000291
6	0.0139000	3.6266000	-0.0000005	-0.0001995	0.0001995
7	-0.9794000	3.4984000	-0.0000326	0.0001234	-0.0001277
8	-1.9143000	3.1142000	-0.0000748	0.0001303	-0.0001502
9	-3.3292000	1.7054000	0.0003170	-0.0001837	0.0003664
10	-3.7157000	0.7744000	-0.0002174	0.0000585	-0.0002251

RADIUS = 3.8534 m
DE = +0.0051 m
DU = -0.2270 m

Appendix G. Global Results Listing from GeoLab Adjustment

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0001
================================================================================
15:32:17, Tue Nov 25, 2008

Input file:  D:\glab32v3\GGAO_06b\GGAO06_doris_2.iob
Output file: D:\glab32v3\GGAO_06b\GGAO06_doris_2.lst
Options file: D:\glab32v3\default_jl.cfg

Geoid File:  D:\glab32v3\geoid99\g1999u08.gsp
```

PARAMETERS		OBSERVATIONS	
Description	Number	Description	Number
No. of Stations	32	Directions	308
Coord Parameters	87	Distances	589
Free Latitudes	29	Azimuths	11
Free Longitudes	29	Vertical Angles	0
Free Heights	29	Zenithal Angles	3
Fixed Coordinates	9	Angles	0
Astro. Latitudes	0	Heights	0
Astro. Longitudes	0	Height Differences	192
Geoid Records	0	Auxiliary Params.	0
All Aux. Pars.	92	2-D Coords.	0
Direction Pars.	92	2-D Coord. Diffs.	0
Scale Parameters	0	3-D Coords.	0
Constant Pars.	0	3-D Coord. Diffs.	24
Rotation Pars.	0		
Translation Pars.	0		
	--------		--------
Total Parameters	179	Total Observations	1127
Degrees of Freedom =	948		

```
--------------------------------------------------------------------------------
                        SUMMARY OF SELECTED OPTIONS
--------------------------------------------------------------------------------
    OPTION                                |   SELECTION
--------------------------------------------------------------------------------
    Computation Mode                      |   Adjustment
    Maximum Iterations                    |   10
    Convergence Criterion                 |   0.00100
    Angular Misclosure Limit Factor       |   2.00
    Linear Misclosure Limit Factor        |   2.00
    Residual Rejection Criterion          |   Tau Max
    Confidence Region Types               |   1D 2D 3D Station Relative
    Relative Confidence Regions           |   Connected Only
    Variance Factor (VF) Known            |   Yes
    Scale Covariance Matrix With VF       |   Yes
    Scale Residual Variances With VF      |   No
    Force Convergence in Max Iters        |   No
    Distances Contribute To Heights       |   No
    Compute Full Inverse                  |   Yes
    Optimize Band Width                   |   Yes
    Generate Initial Coordinates          |   Yes
    Re-Transform Obs After 1st Pass       |   Yes
    Geoid Interpolation Method            |   Bi-Quadratic
--------------------------------------------------------------------------------
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0002

Input Station Data:

FFF	STATION	ELIP-LATITUDE / ASTRO-LATITUDE / N/S DEFLECTION	ELIP-LONGITUDE / ASTRO-LONGITUDE / N/S DEFLECTION	ELIP-HEIGHT / ORTHO-HEIGHT / GEOID-HEIGHT
000	4005W	N 39 1 18.02097	W 76 49 37.51233	14.2390
		N 39 1 16.35097	W 76 49 29.30029	46.5981
		- 0 0 1.67	0 0 6.38	-32.3591
000	4006E	N 39 1 18.21820	W 76 49 36.58372	14.5090
		N 39 1 16.53820	W 76 49 28.37167	46.8689
		- 0 0 1.68	0 0 6.38	-32.3599
111	7105	N 39 1 14.17743	W 76 49 39.69784	19.1940
		N 39 1 12.50743	W 76 49 31.48592	51.5526
		- 0 0 1.67	0 0 6.38	-32.3586
000	7108(93)	N 39 1 18.93304	W 76 49 35.55078	13.7450
		N 39 1 17.25304	W 76 49 27.32584	46.1056
		- 0 0 1.68	0 0 6.39	-32.3606
000	7108RM1	N 39 1 18.36753	W 76 49 34.47589	13.3550
		N 39 1 16.68753	W 76 49 26.25096	45.7164
		- 0 0 1.68	0 0 6.39	-32.3614
000	7918ECC	N 39 1 14.58437	W 76 49 40.27839	18.7050
		N 39 1 12.91437	W 76 49 32.06646	51.0629
		- 0 0 1.67	0 0 6.38	-32.3579
000	CAL(A)01	N 39 1 15.63988	W 76 49 35.68960	16.4290
		N 39 1 13.95988	W 76 49 27.46476	48.7904
		- 0 0 1.68	0 0 6.39	-32.3614
000	CAL(B)01	N 39 1 14.35265	W 76 49 30.55670	16.1550
		N 39 1 12.66265	W 76 49 22.30616	48.5204
		- 0 0 1.69	0 0 6.41	-32.3654
000	CAL(B)02	N 39 1 13.63259	W 76 49 32.46976	16.9660
		N 39 1 11.94259	W 76 49 24.21925	49.3302
		- 0 0 1.69	0 0 6.41	-32.3642
000	CAL(C)01	N 39 1 12.74557	W 76 49 32.85658	17.3140
		N 39 1 11.05557	W 76 49 24.60609	49.6784
		- 0 0 1.69	0 0 6.41	-32.3644
000	CAL(D)98	N 39 1 12.14113	W 76 49 40.64593	19.8850
		N 39 1 10.47113	W 76 49 32.43408	52.2434
		- 0 0 1.67	0 0 6.38	-32.3584
000	DORIS GREB	N 39 1 12.22263	W 76 49 40.41829	21.7240
		N 39 1 10.55263	W 76 49 32.20644	54.0824
		- 0 0 1.67	0 0 6.38	-32.3584
000	DORIS PIER	N 39 1 12.22263	W 76 49 40.41829	21.2060
		N 39 1 10.55263	W 76 49 32.20644	53.5644
		- 0 0 1.67	0 0 6.38	-32.3584
000	GODDARD	N 39 1 14.77710	W 76 49 40.58620	18.0320
		N 39 1 13.10710	W 76 49 32.37426	50.3899
		- 0 0 1.67	0 0 6.38	-32.3579
000	GODDARD2	N 39 1 15.81021	W 76 49 39.87005	17.2800
		N 39 1 14.14021	W 76 49 31.65808	49.6384
		- 0 0 1.67	0 0 6.38	-32.3584
000	GORF89	N 39 1 12.78695	W 76 49 39.68450	18.3500
		N 39 1 11.11695	W 76 49 31.45976	50.7091
		- 0 0 1.67	0 0 6.39	-32.3591
000	MOB7(01)	N 39 1 14.17718	W 76 49 39.69922	22.3330
		N 39 1 12.50718	W 76 49 31.48730	54.6916
		- 0 0 1.67	0 0 6.38	-32.3586
000	MOB7(03)	N 39 1 14.17718	W 76 49 39.69922	22.3330
		N 39 1 12.50718	W 76 49 31.48730	54.6916
		- 0 0 1.67	0 0 6.38	-32.3586
000	MOB7(91)	N 39 1 14.17711	W 76 49 39.69917	22.3430
		N 39 1 12.50711	W 76 49 31.48725	54.7016
		- 0 0 1.67	0 0 6.38	-32.3586
000	MOB7(92)	N 39 1 14.17711	W 76 49 39.69911	22.3320
		N 39 1 12.50711	W 76 49 31.48719	54.6906
		- 0 0 1.67	0 0 6.38	-32.3586

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0003

Input Station Data:

FFF	STATION	ELIP-LATITUDE ASTRO-LATITUDE N/S DEFLECTION	ELIP-LONGITUDE ASTRO-LONGITUDE N/S DEFLECTION	ELIP-HEIGHT ORTHO-HEIGHT GEOID-HEIGHT
000	MV3(02)	N 39 1 18.93314 N 39 1 17.25314 - 0 0 1.68	W 76 49 35.55082 W 76 49 27.32588 0 0 6.39	18.0970 50.4576 -32.3606
111	MV3(02PRE)	N 39 1 18.93314 N 39 1 17.25314 - 0 0 1.68	W 76 49 35.55082 W 76 49 27.32588 0 0 6.39	18.0970 50.4576 -32.3606
000	MV3(03)	N 39 1 18.93314 N 39 1 17.25314 - 0 0 1.68	W 76 49 35.55082 W 76 49 27.32588 0 0 6.39	16.8000 49.1606 -32.3606
111	MV3(03PRE)	N 39 1 18.93311 N 39 1 17.25311 - 0 0 1.68	W 76 49 35.55097 W 76 49 27.32603 0 0 6.39	17.0410 49.4016 -32.3606
000	MV3PED	N 39 1 18.93311 N 39 1 17.25311 - 0 0 1.68	W 76 49 35.55088 W 76 49 27.32594 0 0 6.39	17.1430 49.5036 -32.3606
000	NGEOS	N 39 1 15.43372 N 39 1 13.76372 - 0 0 1.67	W 76 49 38.95940 W 76 49 30.74744 0 0 6.38	18.9670 51.3261 -32.3591
000	PIER(A)95	N 39 1 19.91830 N 39 1 18.23830 - 0 0 1.68	W 76 49 35.36084 W 76 49 27.14874 0 0 6.38	13.7640 46.1244 -32.3604
000	PIER(B)95	N 39 1 16.36195 N 39 1 14.69195 - 0 0 1.67	W 76 49 38.36408 W 76 49 30.15209 0 0 6.38	17.7530 50.1119 -32.3589
000	PIER(C)95	N 39 1 19.44860 N 39 1 17.77860 - 0 0 1.67	W 76 49 37.49768 W 76 49 29.28559 0 0 6.38	12.6560 45.0149 -32.3589
000	SGEOS	N 39 1 12.63679 N 39 1 10.95679 - 0 0 1.68	W 76 49 38.94127 W 76 49 30.71653 0 0 6.39	18.8670 51.2269 -32.3599
000	SLR00(03)	N 39 1 12.96614 N 39 1 11.28614 - 0 0 1.68	W 76 49 38.92634 W 76 49 30.70159 0 0 6.39	22.2000 54.5599 -32.3599
000	TLRS4(03)	N 39 1 15.27143 N 39 1 13.60143 - 0 0 1.67	W 76 49 38.82208 W 76 49 30.61013 0 0 6.38	21.2790 53.6381 -32.3591

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0004
================================================================================
Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                OBSERVATION STD.DEV.     MISC
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: DISTANCES
DIST              NGEOS        PIER(B)95            32.0324   0.0010  -0.0023
DIST              NGEOS        PIER(B)95            32.0324   0.0010  -0.0023
DIST              NGEOS        MOB7(03)             42.7711   0.0010   0.0022
DIST              NGEOS        MOB7(03)             42.7708   0.0010   0.0025
DIST              NGEOS        CAL(B)02            165.7149   0.0011  -0.0021
DIST              NGEOS        CAL(C)01            168.6026   0.0011   0.0023
DIST              NGEOS        CAL(C)01            168.6024   0.0011   0.0025
DIST              NGEOS        CAL(B)02            165.7104   0.0011   0.0024
DIST              7918ECC      CAL(C)01            187.3299   0.0011   0.0030
DIST              7918ECC      CAL(C)01            187.3298   0.0011   0.0031
DIST              7918ECC      CAL(B)02            190.1279   0.0011   0.0035
DIST              4005W        NGEOS                87.1790   0.0010  -0.0022
DIST              4005W        PIER(B)95            55.2208   0.0010   0.0021
DIST              4005W        7108RM1              73.8284   0.0010  -0.0021
DIST              4005W        4006E                23.1508   0.0010   0.0022
DIST              4005W        7108RM1              73.8240   0.0010   0.0023
DIST              4005W        7108RM1              73.8239   0.0010   0.0024
DIST              4006E        NGEOS               103.2448   0.0010  -0.0021
DIST              PIER(A)95    MV3PED               30.9062   0.0010   0.0022
DIST              PIER(A)95    MV3PED               30.9061   0.0010   0.0023
DIST              PIER(B)95    CAL(A)01             68.0962   0.0010  -0.0022
DIST              PIER(B)95    CAL(A)01             68.0918   0.0010   0.0022
DIST              PIER(B)95    MOB7(01)             74.7807   0.0010  -0.0027
DIST              PIER(B)95    4005W                55.2208   0.0010   0.0021
DIST              PIER(B)95    CAL(A)01             68.0914   0.0010   0.0026
DIST              PIER(B)95    4005W                55.2252   0.0010  -0.0023
DIST              PIER(B)95    4005W                55.2251   0.0010  -0.0022
DIST              PIER(C)95    NGEOS               128.8635   0.0011  -0.0024
DIST              PIER(C)95    4006E                43.8891   0.0010   0.0024
DIST              PIER(C)95    7108RM1              79.9762   0.0010  -0.0023
DIST              PIER(C)95    7108RM1              79.9761   0.0010  -0.0022
DIST              PIER(C)95    NGEOS               128.8590   0.0011   0.0022
DIST              PIER(C)95    4005W                44.0526   0.0010   0.0023
DIST              PIER(C)95    7108RM1              79.9718   0.0010   0.0022
DIST              PIER(C)95    7108RM1              79.9718   0.0010   0.0022
DIST              7108RM1      PIER(B)95           112.2207   0.0011  -0.0025
DIST              7108RM1      PIER(B)95           112.2205   0.0011  -0.0023
DIST              7108RM1      NGEOS               140.8849   0.0011   0.0024
DIST              7108RM1      NGEOS               140.8848   0.0011   0.0025
DIST              7108RM1      PIER(B)95           112.2158   0.0011   0.0023
DIST              7108RM1      MV3PED               31.4178   0.0010   0.0028
DIST              7108RM1      MV3PED               31.4180   0.0010   0.0026
DIST              CAL(A)01     NGEOS                78.9526   0.0010   0.0025
DIST              CAL(A)01     NGEOS                78.9527   0.0010   0.0024
DIST              CAL(B)01     MOB7(01)            220.0832   0.0011   0.0023
DIST              MOB7(01)     CAL(A)01            106.6467   0.0010  -0.0023
DIST              MOB7(01)     CAL(A)01            106.6466   0.0010  -0.0022
DIST              MOB7(01)     PIER(B)95            74.7807   0.0010  -0.0027
DIST              MOB7(03)     NGEOS                42.7709   0.0010   0.0023
DIST              MOB7(03)     NGEOS                42.7709   0.0010   0.0023
DIST              MOB7(03)     TLRS4(03)            39.8098   0.0010   0.0025
DIST              CAL(B)02     CAL(D)98            202.0166   0.0011  -0.0027
DIST              CAL(D)98     DORIS PIER            6.2880   0.0010  -0.1196
DIST              CAL(D)98     DORIS PIER            6.2888   0.0010  -0.1204
DIST              DORIS PIER   CAL(A)01            154.6605   0.0011   0.4772
DIST              DORIS PIER   CAL(A)01            154.6591   0.0011   0.4786
DIST              DORIS PIER   CAL(A)01            154.6598   0.0011   0.4779
DIST              DORIS PIER   CAL(D)98              6.2302   0.0010  -0.0618
DIST              DORIS PIER   CAL(D)98              6.2290   0.0010  -0.0606
DIST              DORIS PIER   GORF89               24.4422   0.0010   0.5097
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0005
================================================================================
Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                OBSERVATION STD.DEV.     MISC
---- ------------ ------------ ------------ ----------------- -------- --------
DIST              DORIS PIER   SGEOS                37.7055   0.0010   0.1240
DIST              DORIS PIER   GORF89               24.4427   0.0010   0.5092
DIST              DORIS PIER   SGEOS                37.7072   0.0010   0.1223
DIST              SGEOS        DORIS PIER           37.7142   0.0010   0.1153
DIST              SGEOS        DORIS PIER           37.7126   0.0010   0.1169
DIST              GORF89       DORIS PIER           24.4530   0.0010   0.4989
DIST              GORF89       DORIS PIER           24.4534   0.0010   0.4985
GROUP: DIRECTIONS
DIR               GODDARD      MOB7(03)        83 21   29.49 5.15        18.38
DIR               GODDARD2     7105            57 22   15.99 2.97         9.22
DIR               GODDARD2     MOB7(03)        57 24   27.51 2.96        15.73
DIR               GORF89       CAL(B)02        69 23   24.72 1.09         4.25
DIR               NGEOS        4005W            7 42   57.11 1.81         3.75
DIR               NGEOS        CAL(B)02        83  0   22.78 1.12        -3.68
DIR               NGEOS        CAL(C)01        92 52   21.90 1.11        -2.34
DIR               NGEOS        CAL(B)02       226 56   28.25 1.12         2.73
DIR               NGEOS        7108(93)       205  9   54.26 1.28         3.56
DIR               7918ECC      CAL(A)01        59  0   25.51 1.45       -10.15
DIR               7918ECC      CAL(B)02        84 19    1.71 1.04       -12.25
DIR               7918ECC      CAL(C)01        93  3   24.29 1.05       -13.25
DIR               7918ECC      CAL(D)98       172  7   55.08 2.05       -18.75
DIR               7108(93)     CAL(A)01        57 53   18.93 1.60        -8.77
DIR               7108(93)     PIER(B)95       96 29   17.90 1.56        -9.63
DIR               7108(93)     PIER(C)95      164 45   29.20 3.03       -15.38
DIR               PIER(A)95    CAL(A)01        27 25   41.36 1.31        -6.05
DIR               PIER(A)95    NGEOS           56  2   34.78 1.14        -7.11
DIR               PIER(A)95    PIER(B)95       57 22   21.66 1.31        -5.50
DIR               PIER(A)95    CAL(A)01        27 25   32.16 1.31         3.15
DIR               PIER(A)95    MV3PED          32 33   34.39 4.77       -21.68
DIR               PIER(A)95    NGEOS           56  2   24.58 1.14         3.09
DIR               PIER(A)95    PIER(B)95       57 22   12.79 1.31         3.37
DIR               PIER(B)95    4005W            9 28   24.78 2.73         6.00
DIR               PIER(B)95    PIER(A)95       21  1   23.35 1.31         2.89
DIR               PIER(B)95    7108(93)       193 54   18.48 1.56        -5.97
DIR               PIER(C)95    NGEOS           15 23   43.36 1.33         3.33
DIR               PIER(C)95    MV3PED          34 29   22.20 3.02       -10.43
DIR               7108RM1      PIER(C)95       64 37   38.16 1.95         4.47
DIR               7108RM1      PIER(A)95      105 59   34.31 2.87         7.24
DIR               CAL(A)01     PIER(A)95       98  3    6.10 1.31        -2.88
DIR               CAL(B)01     NGEOS           51 13    9.88 1.00        -2.66
DIR               CAL(B)01     PIER(B)95       60  6   46.70 1.02        -4.58
DIR               CAL(C)01     SLR00(03)      253 52   51.76 1.22        -3.44
DIR               CAL(D)98     CAL(B)02        70  8   33.02 1.01         7.97
DIR               CAL(D)98     CAL(C)01        77 37   24.56 1.04         7.56
DIR               MOB7(01)     CAL(A)01        40 16   10.35 1.54        -5.72
DIR               MOB7(01)     CAL(C)01        40  4   35.90 1.11        -2.48
DIR               MOB7(01)     CAL(B)02        70  1   42.02 1.09        -3.79
DIR               MOB7(03)     NGEOS           73 44   39.22 3.48        -7.81
DIR               GORF89       DORIS PIER     179 43   43.42 5.89     -6647.97
DIR               SGEOS        DORIS PIER       2  3   21.10 3.92     -4984.26
DIR               DORIS PIER   CAL(A)01         0 13   39.21 1.17      5586.78
DIR               DORIS PIER   SGEOS           24 21   25.12 3.92      1669.03
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
EHDF              4005W        4006E                 0.2686   0.0010   0.0022
EHDF              4006E        4005W                -0.2686   0.0010  -0.0022
EHDF              CAL(C)01     CAL(B)01             -1.1559   0.0010  -0.0021
EHDF              SLR00(03)    SGEOS                -3.3306   0.0010  -0.0024
EHDF              CAL(D)98     DORIS PIER            0.0308   0.0010   1.2902
EHDF              DORIS PIER   CAL(D)98             -0.0308   0.0010  -1.2902
EHDF              NGEOS        DORIS PIER            0.9480   0.0010   1.2903
EHDF              SGEOS        DORIS PIER            1.0475   0.0010   1.2900
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0006
================================================================================
Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
```

TYPE	AT	FROM	TO	OBSERVATION	STD.DEV.	MISC
EHDF		DORIS PIER	SGEOS	-1.0480	0.0010	-1.2895
EHDF		SGEOS	DORIS PIER	1.0480	0.0010	1.2895
EHDF		DORIS PIER	SGEOS	-1.0473	0.0010	-1.2902
DXCT		MV3(02PRE)	MV3(02)	0.0060	0.0020	-0.0060
DYCT		MV3(02PRE)	MV3(02)	0.0429	0.0020	-0.0429
DZCT		MV3(02PRE)	MV3(02)	0.0089	0.0020	-0.0089
DXCT		MV3(02PRE)	MV3(02)	0.0064	0.0020	-0.0064
DYCT		MV3(02PRE)	MV3(02)	0.0427	0.0020	-0.0427
DZCT		MV3(02PRE)	MV3(02)	0.0084	0.0020	-0.0084
DXCT		MV3(03PRE)	MV3(03)	-0.0357	0.0020	-0.0036
DYCT		MV3(03PRE)	MV3(03)	0.1747	0.0020	0.0090
DZCT		MV3(03PRE)	MV3(03)	-0.1406	0.0020	-0.0104

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0007
================================================================================
Solution (pass 1):
NAME         TYPE           OLD VALUE          CORRECTION       UPDATED VALUE
------------ ---- ------------------- ------------------- -------------------
4005W        ELAT   N 39 01  18.02097      0  0  -0.00003   N 39 01  18.02094
4005W        ELON   W 76 49  37.51233      0  0   0.00004   W 76 49  37.51229
4005W        EHYT             14.2390            0.0007             14.2397
4006E        ELAT   N 39 01  18.21820      0  0  -0.00004   N 39 01  18.21816
4006E        ELON   W 76 49  36.58372      0  0   0.00004   W 76 49  36.58368
4006E        EHYT             14.5090           -0.0003             14.5087
7108(93)     ELAT   N 39 01  18.93304      0  0  -0.00005   N 39 01  18.93299
7108(93)     ELON   W 76 49  35.55078      0  0   0.00005   W 76 49  35.55073
7108(93)     EHYT             13.7450           -0.0001             13.7449
7108RM1      ELAT   N 39 01  18.36753      0  0  -0.00003   N 39 01  18.36750
7108RM1      ELON   W 76 49  34.47589      0  0   0.00004   W 76 49  34.47585
7108RM1      EHYT             13.3550            0.0006             13.3556
7918ECC      ELAT   N 39 01  14.58437      0  0   0.00011   N 39 01  14.58448
7918ECC      ELON   W 76 49  40.27839      0  0   0.00033   W 76 49  40.27806
7918ECC      EHYT             18.7050            0.0004             18.7054
CAL(A)01     ELAT   N 39 01  15.63988      0  0  -0.00005   N 39 01  15.63983
CAL(A)01     ELON   W 76 49  35.68960      0  0   0.00003   W 76 49  35.68957
CAL(A)01     EHYT             16.4290           -0.0003             16.4287
CAL(B)01     ELAT   N 39 01  14.35265      0  0   0.00003   N 39 01  14.35268
CAL(B)01     ELON   W 76 49  30.55670      0  0   0.00006   W 76 49  30.55664
CAL(B)01     EHYT             16.1550            0.0001             16.1551
CAL(B)02     ELAT   N 39 01  13.63259      0  0   0.00000   N 39 01  13.63259
CAL(B)02     ELON   W 76 49  32.46976      0  0   0.00007   W 76 49  32.46969
CAL(B)02     EHYT             16.9660            0.0005             16.9665
CAL(C)01     ELAT   N 39 01  12.74557      0  0   0.00001   N 39 01  12.74558
CAL(C)01     ELON   W 76 49  32.85658      0  0   0.00010   W 76 49  32.85648
CAL(C)01     EHYT             17.3140           -0.0005             17.3135
CAL(D)98     ELAT   N 39 01  12.14113      0  0   0.00025   N 39 01  12.14138
CAL(D)98     ELON   W 76 49  40.64593      0  0   0.00057   W 76 49  40.64536
CAL(D)98     EHYT             19.8850            0.0002             19.8852
DORIS GREB   ELAT   N 39 01  12.22263      0  0   0.02946   N 39 01  12.25209
DORIS GREB   ELON   W 76 49  40.41829      0  0  -0.00928   W 76 49  40.42757
DORIS GREB   EHYT             21.7240           -1.2901             20.4339
DORIS PIER   ELAT   N 39 01  12.22263      0  0   0.02946   N 39 01  12.25209
DORIS PIER   ELON   W 76 49  40.41829      0  0  -0.00928   W 76 49  40.42757
DORIS PIER   EHYT             21.2060           -1.2901             19.9159
GODDARD      ELAT   N 39 01  14.77710      0  0  -0.00004   N 39 01  14.77706
GODDARD      ELON   W 76 49  40.58620      0  0   0.00003   W 76 49  40.58617
GODDARD      EHYT             18.0320           -0.0004             18.0316
GODDARD2     ELAT   N 39 01  15.81021      0  0   0.00001   N 39 01  15.81022
GODDARD2     ELON   W 76 49  39.87005      0  0   0.00010   W 76 49  39.86995
GODDARD2     EHYT             17.2800            0.0004             17.2804
GORF89       ELAT   N 39 01  12.78695      0  0  -0.00003   N 39 01  12.78692
GORF89       ELON   W 76 49  39.68450      0  0   0.00000   W 76 49  39.68450
GORF89       EHYT             18.3500           -0.0003             18.3497
MOB7(01)     ELAT   N 39 01  14.17718      0  0  -0.00009   N 39 01  14.17709
MOB7(01)     ELON   W 76 49  39.69922      0  0   0.00008   W 76 49  39.69914
MOB7(01)     EHYT             22.3330           -0.0007             22.3323
MOB7(03)     ELAT   N 39 01  14.17718      0  0   0.00000   N 39 01  14.17718
MOB7(03)     ELON   W 76 49  39.69922      0  0   0.00005   W 76 49  39.69917
MOB7(03)     EHYT             22.3330           -0.0002             22.3328
MOB7(91)     ELAT   N 39 01  14.17711      0  0  -0.00001   N 39 01  14.17710
MOB7(91)     ELON   W 76 49  39.69917      0  0   0.00000   W 76 49  39.69917
MOB7(91)     EHYT             22.3430            0.0004             22.3434
MOB7(92)     ELAT   N 39 01  14.17711      0  0   0.00002   N 39 01  14.17713
MOB7(92)     ELON   W 76 49  39.69911      0  0  -0.00001   W 76 49  39.69912
MOB7(92)     EHYT             22.3320            0.0003             22.3323
MV3(02)      ELAT   N 39 01  18.93314      0  0   0.00104   N 39 01  18.93418
MV3(02)      ELON   W 76 49  35.55082      0  0   0.00066   W 76 49  35.55016
MV3(02)      EHYT             18.0970           -0.0258             18.0712
MV3(03)      ELAT   N 39 01  18.93314      0  0   0.00007   N 39 01  18.93321
MV3(03)      ELON   W 76 49  35.55082      0  0   0.00006   W 76 49  35.55076
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0008

Solution (pass 1):

NAME	TYPE	OLD VALUE	CORRECTION	UPDATED VALUE
MV3(03)	EHYT	16.8000	0.0140	16.8140
MV3PED	ELAT	N 39 01 18.93311	0 0 -0.00005	N 39 01 18.93306
MV3PED	ELON	W 76 49 35.55088	0 0 0.00000	W 76 49 35.55088
MV3PED	EHYT	17.1430	0.0002	17.1432
NGEOS	ELAT	N 39 01 15.43372	0 0 -0.00005	N 39 01 15.43367
NGEOS	ELON	W 76 49 38.95940	0 0 0.00005	W 76 49 38.95935
NGEOS	EHYT	18.9670	0.0002	18.9672
PIER(A)95	ELAT	N 39 01 19.91830	0 0 -0.00004	N 39 01 19.91826
PIER(A)95	ELON	W 76 49 35.36084	0 0 0.00003	W 76 49 35.36081
PIER(A)95	EHYT	13.7640	-0.0004	13.7636
PIER(B)95	ELAT	N 39 01 16.36195	0 0 -0.00004	N 39 01 16.36191
PIER(B)95	ELON	W 76 49 38.36408	0 0 0.00004	W 76 49 38.36404
PIER(B)95	EHYT	17.7530	-0.0001	17.7529
PIER(C)95	ELAT	N 39 01 19.44860	0 0 -0.00004	N 39 01 19.44856
PIER(C)95	ELON	W 76 49 37.49768	0 0 0.00003	W 76 49 37.49765
PIER(C)95	EHYT	12.6560	-0.0001	12.6559
SGEOS	ELAT	N 39 01 12.63679	0 0 0.00002	N 39 01 12.63681
SGEOS	ELON	W 76 49 38.94127	0 0 -0.00002	W 76 49 38.94129
SGEOS	EHYT	18.8670	-0.0003	18.8667
SLR00(03)	ELAT	N 39 01 12.96614	0 0 0.00003	N 39 01 12.96617
SLR00(03)	ELON	W 76 49 38.92634	0 0 0.00011	W 76 49 38.92623
SLR00(03)	EHYT	22.2000	-0.0003	22.1997
TLRS4(03)	ELAT	N 39 01 15.27143	0 0 -0.00005	N 39 01 15.27138
TLRS4(03)	ELON	W 76 49 38.82208	0 0 0.00004	W 76 49 38.82204
TLRS4(03)	EHYT	21.2790	0.0001	21.2791

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0009
================================================================================
Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                OBSERVATION STD.DEV.     MISC
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: DISTANCES
DIST              GORF89       CAL(D)98             30.5599   0.0010  -0.0158
DIST              GORF89       CAL(D)98             30.5602   0.0010  -0.0161
DIST              GORF89       CAL(D)98             30.5590   0.0010  -0.0149
DIST              GORF89       CAL(D)98             30.5595   0.0010  -0.0154
DIST              NGEOS        PIER(B)95            32.0324   0.0010  -0.0023
DIST              NGEOS        PIER(B)95            32.0324   0.0010  -0.0023
DIST              NGEOS        CAL(C)01            168.6026   0.0011   0.0026
DIST              NGEOS        CAL(C)01            168.6024   0.0011   0.0028
DIST              NGEOS        CAL(B)02            165.7104   0.0011   0.0025
DIST              SGEOS        7105                 50.8793   0.0010  -0.0023
DIST              SGEOS        CAL(D)98             43.7750   0.0010  -0.0154
DIST              SGEOS        CAL(D)98             43.7752   0.0010  -0.0156
DIST              SGEOS        CAL(B)02            158.6900   0.0011   0.0024
DIST              SGEOS        CAL(B)02            158.6899   0.0011   0.0025
DIST              SGEOS        CAL(C)01            146.4188   0.0011   0.0050
DIST              SGEOS        CAL(C)01            146.4191   0.0011   0.0047
DIST              SGEOS        CAL(B)02            158.6900   0.0011   0.0024
DIST              SGEOS        CAL(B)02            158.6896   0.0011   0.0028
DIST              7918ECC      GODDARD2             39.0824   0.0010  -0.0030
DIST              7918ECC      GODDARD2             39.0827   0.0010  -0.0033
DIST              7918ECC      CAL(A)01            115.1068   0.0011  -0.0064
DIST              7918ECC      CAL(A)01            115.1070   0.0011  -0.0066
DIST              7918ECC      CAL(D)98             75.8697   0.0010  -0.0043
DIST              7918ECC      CAL(D)98             75.8698   0.0010  -0.0044
DIST              7918ECC      CAL(B)02            190.1296   0.0011  -0.0038
DIST              7918ECC      CAL(B)02            190.1279   0.0011  -0.0021
DIST              4005W        PIER(B)95            55.2208   0.0010   0.0023
DIST              4005W        PIER(B)95            55.2209   0.0010   0.0022
DIST              4005W        4006E                23.1508   0.0010   0.0023
DIST              4005W        7108RM1              73.8240   0.0010   0.0024
DIST              4005W        7108RM1              73.8239   0.0010   0.0025
DIST              4006E        NGEOS               103.2448   0.0010  -0.0021
DIST              PIER(A)95    CAL(C)01            229.2770   0.0011  -0.0024
DIST              PIER(A)95    MV3PED               30.9062   0.0010   0.0028
DIST              PIER(A)95    MV3PED               30.9061   0.0010   0.0029
DIST              PIER(B)95    CAL(A)01             68.0962   0.0010  -0.0025
DIST              PIER(B)95    4005W                55.2209   0.0010   0.0022
DIST              PIER(B)95    4005W                55.2208   0.0010   0.0023
DIST              PIER(B)95    CAL(A)01             68.0914   0.0010   0.0023
DIST              PIER(B)95    SLR00(03)           105.6840   0.0010  -0.0034
DIST              PIER(C)95    NGEOS               128.8635   0.0011  -0.0022
DIST              PIER(C)95    4006E                43.8891   0.0010   0.0027
DIST              PIER(C)95    7108RM1              79.9762   0.0010  -0.0022
DIST              PIER(C)95    7108RM1              79.9761   0.0010  -0.0021
DIST              PIER(C)95    NGEOS               128.8590   0.0011   0.0023
DIST              PIER(C)95    4005W                44.0525   0.0010   0.0022
DIST              PIER(C)95    7108RM1              79.9717   0.0010   0.0023
DIST              PIER(C)95    7108RM1              79.9717   0.0010   0.0023
DIST              7108RM1      PIER(B)95           112.2206   0.0011  -0.0024
DIST              7108RM1      PIER(B)95           112.2204   0.0011  -0.0022
DIST              7108RM1      NGEOS               140.8849   0.0011   0.0025
DIST              7108RM1      NGEOS               140.8848   0.0011   0.0026
DIST              7108RM1      PIER(B)95           112.2158   0.0011   0.0025
DIST              7108RM1      MV3PED               31.4178   0.0010   0.0034
DIST              7108RM1      MV3PED               31.4180   0.0010   0.0032
DIST              CAL(A)01     PIER(B)95            68.0958   0.0010  -0.0021
DIST              CAL(A)01     MOB7(03)            106.6456   0.0010  -0.0023
DIST              CAL(A)01     SLR00(03)           113.5538   0.0011  -0.0037
DIST              CAL(D)98     SLR00(03)            48.6212   0.0010  -0.0148
DIST              CAL(D)98     CAL(C)01            188.3232   0.0011  -0.0109
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0010
================================================================================
Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                OBSERVATION STD.DEV.     MISC
---- ------------ ------------ ------------ ----------------- -------- --------
DIST              CAL(D)98     CAL(C)01             188.3224   0.0011  -0.0101
DIST              CAL(D)98     CAL(B)02             202.0140   0.0011  -0.0136
DIST              CAL(D)98     CAL(B)02             202.0138   0.0011  -0.0134
DIST              CAL(D)98     7918ECC               75.8711   0.0010  -0.0058
DIST              CAL(D)98     7918ECC               75.8711   0.0010  -0.0058
DIST              MOB7(01)     CAL(A)01             106.6467   0.0010  -0.0029
DIST              MOB7(01)     CAL(A)01             106.6466   0.0010  -0.0028
DIST              CAL(B)02     SGEOS                158.6900   0.0011   0.0024
DIST              CAL(B)02     SGEOS                158.6896   0.0011   0.0028
DIST              CAL(B)02     SGEOS                158.6896   0.0011   0.0028
DIST              CAL(B)02     SGEOS                158.6902   0.0011   0.0022
DIST              CAL(B)02     7918ECC              190.1296   0.0011  -0.0038
DIST              CAL(B)02     7918ECC              190.1302   0.0011  -0.0044
DIST              CAL(B)02     CAL(D)98             202.0166   0.0011  -0.0161
DIST              CAL(D)98     DORIS PIER             6.2641   0.0010  -0.0107
DIST              CAL(D)98     DORIS PIER             6.2649   0.0010  -0.0115
DIST              DORIS PIER   CAL(A)01             154.6619   0.0011  -0.0104
DIST              DORIS PIER   CAL(A)01             154.6605   0.0011  -0.0090
DIST              DORIS PIER   CAL(A)01             154.6612   0.0011  -0.0097
DIST              DORIS PIER   CAL(D)98               6.2644   0.0010  -0.0110
DIST              DORIS PIER   CAL(D)98               6.2632   0.0010  -0.0098
DIST              DORIS PIER   GORF89                24.3780   0.0010  -0.0056
DIST              DORIS PIER   SGEOS                 37.6826   0.0010   0.0030
DIST              DORIS PIER   GORF89                24.3785   0.0010  -0.0062
DIST              SGEOS        CAL(D)98              43.7758   0.0010  -0.0161
DIST              SGEOS        CAL(D)98              43.7751   0.0010  -0.0154
DIST              SGEOS        DORIS PIER            37.6829   0.0010   0.0028
DIST              GORF89       CAL(D)98              30.5592   0.0010  -0.0151
DIST              GORF89       DORIS PIER            24.3784   0.0010  -0.0061
DIST              GORF89       DORIS PIER            24.3788   0.0010  -0.0065
GROUP: DIRECTIONS
DIR               GORF89       CAL(D)98       217 12    15.78 4.82       -12.47
DIR               GORF89       CAL(D)98       217 12    14.46 4.82       -13.50
DIR               NGEOS        CAL(B)02        93 43    45.80 1.12        -2.51
DIR               NGEOS        GORF89         176 12    28.58 1.88         3.78
DIR               NGEOS        MOB7(03)       178  5    21.82 3.48         9.79
DIR               NGEOS        GODDARD2       271 20    47.55 5.91        14.47
DIR               NGEOS        GORF89          82 28    43.66 1.88         3.99
DIR               SGEOS        GORF89          34 57    41.55 7.92       -19.20
DIR               SGEOS        SLR00(03)      112 27    51.06 13.65       67.46
DIR               SGEOS        CAL(D)98       209 22    16.16 3.40         7.20
DIR               7918ECC      GODDARD2         0  0     0.00 3.80       -13.87
DIR               7918ECC      CAL(A)01        59  0    25.51 1.45         4.64
DIR               7918ECC      CAL(B)02        84 19     1.71 1.04         2.63
DIR               7918ECC      CAL(D)98       172  7    55.08 2.05       -22.57
DIR               PIER(A)95    MV3PED          32 33    34.39 4.77       -18.40
DIR               PIER(B)95    CAL(A)01         0 49    55.39 2.25         4.80
DIR               PIER(C)95    MV3PED          34 29    22.20 3.02        -6.60
DIR               CAL(A)01     PIER(B)95      160 27    35.60 2.25         6.23
DIR               CAL(D)98     7918ECC          0  0     0.00 2.05       -24.56
DIR               CAL(D)98     CAL(B)02        70  8    33.02 1.01         2.39
DIR               CAL(D)98     CAL(C)01        77 37    24.56 1.04         3.82
DIR               CAL(D)98     GORF89           0  0     0.00 4.82       -14.54
DIR               CAL(D)98     SGEOS           20 17    22.88 3.40         7.54
DIR               CAL(B)02     GORF89           0  0     0.00 1.09        -2.79
DIR               CAL(B)02     CAL(D)98       355 23     0.21 1.01         3.06
DIR               CAL(B)02     SLR00(03)       63 40    29.79 1.16         3.18
DIR               CAL(B)02     PIER(B)95      101 54    23.20 1.13        -2.81
DIR               CAL(B)02     CAL(D)98         0  0     0.00 1.01         2.76
DIR               CAL(B)02     NGEOS           32 44    47.30 1.12        -5.18
DIR               CAL(B)02     CAL(D)98         0  0     0.00 1.01         4.48
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0011
================================================================================
Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                OBSERVATION STD.DEV.     MISC
---- ------------ ------------ ------------ ----------------- -------- --------
DIR               CAL(B)02     PIER(B)95       43 51    16.21 1.13        -2.41
DIR               CAL(B)02     CAL(A)01        51 47    33.05 1.63        -6.71
DIR               GORF89       DORIS PIER     179 43    43.42 5.89       171.37
DIR               GORF89       CAL(D)98       181 44    24.16 4.82       -10.35
DIR               SGEOS        CAL(D)98         0  0     0.00 3.40       -31.74
DIR               SGEOS        DORIS PIER       2  3    21.10 3.92        66.07
DIR               SGEOS        GORF89          34 57    40.38 7.92       -49.13
DIR               DORIS PIER   GORF89           0  0     0.00 5.89       138.48
DIR               DORIS PIER   CAL(A)01         0 13    39.21 1.17        -2.98
DIR               DORIS PIER   SGEOS           24 21    25.12 3.92        76.25
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
EHDF              CAL(D)98     SLR00(03)              2.3180   0.0010  -0.0020
EHDF              SLR00(03)    SGEOS                 -3.3306   0.0010  -0.0024
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0012

Solution (pass 2):

NAME	TYPE	OLD VALUE	CORRECTION	UPDATED VALUE
4005W	ELAT	N 39 01 18.02094	0 0 0.00004	N 39 01 18.02098
4005W	ELON	W 76 49 37.51229	0 0 -0.00003	W 76 49 37.51232
4005W	EHYT	14.2397	0.0000	14.2397
4006E	ELAT	N 39 01 18.21816	0 0 0.00004	N 39 01 18.21820
4006E	ELON	W 76 49 36.58368	0 0 -0.00003	W 76 49 36.58370
4006E	EHYT	14.5087	0.0000	14.5087
7108(93)	ELAT	N 39 01 18.93299	0 0 0.00005	N 39 01 18.93304
7108(93)	ELON	W 76 49 35.55073	0 0 -0.00004	W 76 49 35.55077
7108(93)	EHYT	13.7449	0.0000	13.7449
7108RM1	ELAT	N 39 01 18.36750	0 0 0.00004	N 39 01 18.36754
7108RM1	ELON	W 76 49 34.47585	0 0 -0.00003	W 76 49 34.47588
7108RM1	EHYT	13.3556	0.0000	13.3556
7918ECC	ELAT	N 39 01 14.58448	0 0 -0.00011	N 39 01 14.58437
7918ECC	ELON	W 76 49 40.27806	0 0 -0.00021	W 76 49 40.27827
7918ECC	EHYT	18.7054	0.0000	18.7054
CAL(A)01	ELAT	N 39 01 15.63983	0 0 0.00006	N 39 01 15.63989
CAL(A)01	ELON	W 76 49 35.68957	0 0 -0.00001	W 76 49 35.68958
CAL(A)01	EHYT	16.4287	0.0000	16.4287
CAL(B)01	ELAT	N 39 01 14.35268	0 0 -0.00001	N 39 01 14.35267
CAL(B)01	ELON	W 76 49 30.55664	0 0 -0.00004	W 76 49 30.55668
CAL(B)01	EHYT	16.1551	0.0000	16.1551
CAL(B)02	ELAT	N 39 01 13.63259	0 0 0.00001	N 39 01 13.63260
CAL(B)02	ELON	W 76 49 32.46969	0 0 -0.00006	W 76 49 32.46975
CAL(B)02	EHYT	16.9665	0.0000	16.9665
CAL(C)01	ELAT	N 39 01 12.74558	0 0 0.00000	N 39 01 12.74558
CAL(C)01	ELON	W 76 49 32.85648	0 0 -0.00008	W 76 49 32.85656
CAL(C)01	EHYT	17.3135	0.0000	17.3135
CAL(D)98	ELAT	N 39 01 12.14138	0 0 -0.00026	N 39 01 12.14112
CAL(D)98	ELON	W 76 49 40.64536	0 0 -0.00054	W 76 49 40.64590
CAL(D)98	EHYT	19.8852	0.0000	19.8852
DORIS GREB	ELAT	N 39 01 12.25209	0 0 -0.00063	N 39 01 12.25146
DORIS GREB	ELON	W 76 49 40.42757	0 0 0.00035	W 76 49 40.42722
DORIS GREB	EHYT	20.4339	0.0000	20.4339
DORIS PIER	ELAT	N 39 01 12.25209	0 0 -0.00063	N 39 01 12.25146
DORIS PIER	ELON	W 76 49 40.42757	0 0 0.00035	W 76 49 40.42722
DORIS PIER	EHYT	19.9159	0.0000	19.9159
GODDARD	ELAT	N 39 01 14.77706	0 0 0.00004	N 39 01 14.77709
GODDARD	ELON	W 76 49 40.58617	0 0 -0.00003	W 76 49 40.58620
GODDARD	EHYT	18.0316	0.0000	18.0316
GODDARD2	ELAT	N 39 01 15.81022	0 0 0.00001	N 39 01 15.81023
GODDARD2	ELON	W 76 49 39.86995	0 0 -0.00007	W 76 49 39.87002
GODDARD2	EHYT	17.2804	0.0000	17.2804
GORF89	ELAT	N 39 01 12.78692	0 0 0.00002	N 39 01 12.78694
GORF89	ELON	W 76 49 39.68450	0 0 0.00001	W 76 49 39.68449
GORF89	EHYT	18.3497	0.0000	18.3497
MOB7(01)	ELAT	N 39 01 14.17709	0 0 0.00006	N 39 01 14.17715
MOB7(01)	ELON	W 76 49 39.69914	0 0 -0.00004	W 76 49 39.69919
MOB7(01)	EHYT	22.3323	0.0000	22.3323
MOB7(03)	ELAT	N 39 01 14.17718	0 0 0.00003	N 39 01 14.17721
MOB7(03)	ELON	W 76 49 39.69917	0 0 -0.00003	W 76 49 39.69920
MOB7(03)	EHYT	22.3328	0.0000	22.3328
MOB7(91)	ELAT	N 39 01 14.17710	0 0 0.00000	N 39 01 14.17710
MOB7(91)	ELON	W 76 49 39.69917	0 0 0.00000	W 76 49 39.69917
MOB7(91)	EHYT	22.3434	0.0000	22.3434
MOB7(92)	ELAT	N 39 01 14.17713	0 0 0.00000	N 39 01 14.17713
MOB7(92)	ELON	W 76 49 39.69912	0 0 0.00000	W 76 49 39.69912
MOB7(92)	EHYT	22.3323	0.0000	22.3323
MV3(02)	ELAT	N 39 01 18.93418	0 0 0.00000	N 39 01 18.93418
MV3(02)	ELON	W 76 49 35.55016	0 0 0.00000	W 76 49 35.55016
MV3(02)	EHYT	18.0712	0.0000	18.0712
MV3(03)	ELAT	N 39 01 18.93321	0 0 0.00000	N 39 01 18.93321
MV3(03)	ELON	W 76 49 35.55076	0 0 0.00000	W 76 49 35.55076

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0013

Solution (pass 2):

NAME	TYPE	OLD VALUE	CORRECTION	UPDATED VALUE
MV3(03)	EHYT	16.8140	0.0000	16.8140
MV3PED	ELAT	N 39 01 18.93306	0 0 0.00004	N 39 01 18.93310
MV3PED	ELON	W 76 49 35.55088	0 0 -0.00003	W 76 49 35.55091
MV3PED	EHYT	17.1432	0.0000	17.1432
NGEOS	ELAT	N 39 01 15.43367	0 0 0.00004	N 39 01 15.43371
NGEOS	ELON	W 76 49 38.95935	0 0 -0.00003	W 76 49 38.95938
NGEOS	EHYT	18.9672	0.0000	18.9672
PIER(A)95	ELAT	N 39 01 19.91826	0 0 0.00004	N 39 01 19.91830
PIER(A)95	ELON	W 76 49 35.36081	0 0 -0.00002	W 76 49 35.36083
PIER(A)95	EHYT	13.7636	0.0000	13.7636
PIER(B)95	ELAT	N 39 01 16.36191	0 0 0.00004	N 39 01 16.36195
PIER(B)95	ELON	W 76 49 38.36404	0 0 -0.00003	W 76 49 38.36406
PIER(B)95	EHYT	17.7529	0.0000	17.7529
PIER(C)95	ELAT	N 39 01 19.44856	0 0 0.00004	N 39 01 19.44860
PIER(C)95	ELON	W 76 49 37.49765	0 0 -0.00003	W 76 49 37.49767
PIER(C)95	EHYT	12.6559	0.0000	12.6559
SGEOS	ELAT	N 39 01 12.63681	0 0 -0.00003	N 39 01 12.63678
SGEOS	ELON	W 76 49 38.94129	0 0 0.00004	W 76 49 38.94125
SGEOS	EHYT	18.8667	0.0000	18.8667
SLR00(03)	ELAT	N 39 01 12.96617	0 0 -0.00003	N 39 01 12.96614
SLR00(03)	ELON	W 76 49 38.92623	0 0 -0.00009	W 76 49 38.92632
SLR00(03)	EHYT	22.1997	0.0000	22.1997
TLRS4(03)	ELAT	N 39 01 15.27138	0 0 0.00004	N 39 01 15.27142
TLRS4(03)	ELON	W 76 49 38.82204	0 0 -0.00003	W 76 49 38.82207
TLRS4(03)	EHYT	21.2791	0.0000	21.2791

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS           Page 0014
================================================================================
Misclosures (pass 3):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                 OBSERVATION STD.DEV.     MISC
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: DISTANCES
DIST              NGEOS        CAL(B)02             165.7149   0.0011  -0.0024
DIST              NGEOS        CAL(C)01             168.6024   0.0011   0.0022
DIST              NGEOS        CAL(B)02             165.7104   0.0011   0.0021
DIST              4005W        PIER(B)95             55.2208   0.0010   0.0023
DIST              4005W        PIER(B)95             55.2209   0.0010   0.0022
DIST              4005W        4006E                 23.1508   0.0010   0.0023
DIST              4005W        7108RM1               73.8240   0.0010   0.0024
DIST              4005W        7108RM1               73.8239   0.0010   0.0025
DIST              PIER(A)95    CAL(A)01             132.2028   0.0011  -0.0021
DIST              PIER(A)95    MV3PED                30.9062   0.0010   0.0028
DIST              PIER(A)95    MV3PED                30.9061   0.0010   0.0029
DIST              PIER(B)95    CAL(A)01              68.0962   0.0010  -0.0022
DIST              PIER(B)95    CAL(A)01              68.0918   0.0010   0.0022
DIST              PIER(B)95    MOB7(01)              74.7807   0.0010  -0.0022
DIST              PIER(B)95    4005W                 55.2209   0.0010   0.0022
DIST              PIER(B)95    4005W                 55.2208   0.0010   0.0023
DIST              PIER(B)95    CAL(A)01              68.0914   0.0010   0.0026
DIST              PIER(B)95    4005W                 55.2251   0.0010  -0.0021
DIST              PIER(C)95    NGEOS                128.8635   0.0011  -0.0022
DIST              PIER(C)95    4006E                 43.8891   0.0010   0.0027
DIST              PIER(C)95    7108RM1               79.9762   0.0010  -0.0022
DIST              PIER(C)95    7108RM1               79.9761   0.0010  -0.0021
DIST              PIER(C)95    NGEOS                128.8590   0.0011   0.0024
DIST              PIER(C)95    4005W                 44.0525   0.0010   0.0022
DIST              PIER(C)95    7108RM1               79.9717   0.0010   0.0023
DIST              PIER(C)95    7108RM1               79.9717   0.0010   0.0023
DIST              7108RM1      PIER(B)95            112.2206   0.0011  -0.0024
DIST              7108RM1      PIER(B)95            112.2204   0.0011  -0.0022
DIST              7108RM1      NGEOS                140.8849   0.0011   0.0026
DIST              7108RM1      NGEOS                140.8848   0.0011   0.0027
DIST              7108RM1      PIER(B)95            112.2158   0.0011   0.0024
DIST              7108RM1      MV3PED                31.4178   0.0010   0.0034
DIST              7108RM1      MV3PED                31.4180   0.0010   0.0032
DIST              CAL(A)01     NGEOS                 78.9526   0.0010   0.0026
DIST              CAL(A)01     NGEOS                 78.9527   0.0010   0.0025
DIST              MOB7(01)     CAL(A)01             106.6467   0.0010  -0.0022
DIST              MOB7(01)     PIER(B)95             74.7807   0.0010  -0.0022
DIST              CAL(B)02     CAL(D)98             202.0166   0.0011  -0.0031
DIST              DORIS PIER   CAL(A)01             154.6619   0.0011  -0.0024
GROUP: DIRECTIONS
DIR               NGEOS        MOB7(03)       178  5    21.82 3.48         8.26
DIR               PIER(A)95    MV3PED          32 33    34.39 4.77       -18.00
DIR               PIER(C)95    MV3PED          34 29    22.20 3.02        -6.77
DIR               7108RM1      PIER(A)95      105 59    34.31 2.87         5.75
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
EHDF              CAL(D)98     SLR00(03)             2.3180   0.0010  -0.0020
EHDF              SLR00(03)    SGEOS                -3.3306   0.0010  -0.0024
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0015

Solution (pass 3):

NAME	TYPE	OLD VALUE	CORRECTION	UPDATED VALUE
4005W	ELAT	N 39 01 18.02098	0 0 0.00000	N 39 01 18.02098
4005W	ELON	W 76 49 37.51232	0 0 0.00000	W 76 49 37.51232
4005W	EHYT	14.2397	0.0000	14.2397
4006E	ELAT	N 39 01 18.21820	0 0 0.00000	N 39 01 18.21820
4006E	ELON	W 76 49 36.58370	0 0 0.00000	W 76 49 36.58370
4006E	EHYT	14.5087	0.0000	14.5087
7108(93)	ELAT	N 39 01 18.93304	0 0 0.00000	N 39 01 18.93304
7108(93)	ELON	W 76 49 35.55077	0 0 0.00000	W 76 49 35.55077
7108(93)	EHYT	13.7449	0.0000	13.7449
7108RM1	ELAT	N 39 01 18.36754	0 0 0.00000	N 39 01 18.36754
7108RM1	ELON	W 76 49 34.47588	0 0 0.00000	W 76 49 34.47588
7108RM1	EHYT	13.3556	0.0000	13.3556
7918ECC	ELAT	N 39 01 14.58437	0 0 0.00000	N 39 01 14.58437
7918ECC	ELON	W 76 49 40.27827	0 0 0.00000	W 76 49 40.27827
7918ECC	EHYT	18.7054	0.0000	18.7054
CAL(A)01	ELAT	N 39 01 15.63989	0 0 0.00000	N 39 01 15.63989
CAL(A)01	ELON	W 76 49 35.68958	0 0 0.00000	W 76 49 35.68958
CAL(A)01	EHYT	16.4287	0.0000	16.4287
CAL(B)01	ELAT	N 39 01 14.35267	0 0 0.00000	N 39 01 14.35267
CAL(B)01	ELON	W 76 49 30.55668	0 0 0.00000	W 76 49 30.55668
CAL(B)01	EHYT	16.1551	0.0000	16.1551
CAL(B)02	ELAT	N 39 01 13.63260	0 0 0.00000	N 39 01 13.63260
CAL(B)02	ELON	W 76 49 32.46975	0 0 0.00000	W 76 49 32.46975
CAL(B)02	EHYT	16.9665	0.0000	16.9665
CAL(C)01	ELAT	N 39 01 12.74558	0 0 0.00000	N 39 01 12.74558
CAL(C)01	ELON	W 76 49 32.85656	0 0 0.00000	W 76 49 32.85656
CAL(C)01	EHYT	17.3135	0.0000	17.3135
CAL(D)98	ELAT	N 39 01 12.14112	0 0 0.00000	N 39 01 12.14112
CAL(D)98	ELON	W 76 49 40.64590	0 0 0.00000	W 76 49 40.64590
CAL(D)98	EHYT	19.8852	0.0000	19.8852
DORIS GREB	ELAT	N 39 01 12.25146	0 0 0.00000	N 39 01 12.25146
DORIS GREB	ELON	W 76 49 40.42722	0 0 0.00000	W 76 49 40.42722
DORIS GREB	EHYT	20.4339	0.0000	20.4339
DORIS PIER	ELAT	N 39 01 12.25146	0 0 0.00000	N 39 01 12.25146
DORIS PIER	ELON	W 76 49 40.42722	0 0 0.00000	W 76 49 40.42722
DORIS PIER	EHYT	19.9159	0.0000	19.9159
GODDARD	ELAT	N 39 01 14.77709	0 0 0.00000	N 39 01 14.77709
GODDARD	ELON	W 76 49 40.58620	0 0 0.00000	W 76 49 40.58620
GODDARD	EHYT	18.0316	0.0000	18.0316
GODDARD2	ELAT	N 39 01 15.81023	0 0 0.00000	N 39 01 15.81023
GODDARD2	ELON	W 76 49 39.87002	0 0 0.00000	W 76 49 39.87002
GODDARD2	EHYT	17.2804	0.0000	17.2804
GORF89	ELAT	N 39 01 12.78694	0 0 0.00000	N 39 01 12.78694
GORF89	ELON	W 76 49 39.68449	0 0 0.00000	W 76 49 39.68449
GORF89	EHYT	18.3497	0.0000	18.3497
MOB7(01)	ELAT	N 39 01 14.17715	0 0 0.00000	N 39 01 14.17715
MOB7(01)	ELON	W 76 49 39.69919	0 0 0.00000	W 76 49 39.69919
MOB7(01)	EHYT	22.3323	0.0000	22.3323
MOB7(03)	ELAT	N 39 01 14.17721	0 0 0.00000	N 39 01 14.17721
MOB7(03)	ELON	W 76 49 39.69920	0 0 0.00000	W 76 49 39.69920
MOB7(03)	EHYT	22.3328	0.0000	22.3328
MOB7(91)	ELAT	N 39 01 14.17710	0 0 0.00000	N 39 01 14.17710
MOB7(91)	ELON	W 76 49 39.69917	0 0 0.00000	W 76 49 39.69917
MOB7(91)	EHYT	22.3434	0.0000	22.3434
MOB7(92)	ELAT	N 39 01 14.17713	0 0 0.00000	N 39 01 14.17713
MOB7(92)	ELON	W 76 49 39.69912	0 0 0.00000	W 76 49 39.69912
MOB7(92)	EHYT	22.3323	0.0000	22.3323
MV3(02)	ELAT	N 39 01 18.93418	0 0 0.00000	N 39 01 18.93418
MV3(02)	ELON	W 76 49 35.55016	0 0 0.00000	W 76 49 35.55016
MV3(02)	EHYT	18.0712	0.0000	18.0712
MV3(03)	ELAT	N 39 01 18.93321	0 0 0.00000	N 39 01 18.93321
MV3(03)	ELON	W 76 49 35.55076	0 0 0.00000	W 76 49 35.55076

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0016

Solution (pass 3):

NAME	TYPE	OLD VALUE	CORRECTION	UPDATED VALUE
MV3(03)	EHYT	16.8140	0.0000	16.8140
MV3PED	ELAT	N 39 01 18.93310	0 0 0.00000	N 39 01 18.93310
MV3PED	ELON	W 76 49 35.55091	0 0 0.00000	W 76 49 35.55091
MV3PED	EHYT	17.1432	0.0000	17.1432
NGEOS	ELAT	N 39 01 15.43371	0 0 0.00000	N 39 01 15.43371
NGEOS	ELON	W 76 49 38.95938	0 0 0.00000	W 76 49 38.95938
NGEOS	EHYT	18.9672	0.0000	18.9672
PIER(A)95	ELAT	N 39 01 19.91830	0 0 0.00000	N 39 01 19.91830
PIER(A)95	ELON	W 76 49 35.36083	0 0 0.00000	W 76 49 35.36083
PIER(A)95	EHYT	13.7636	0.0000	13.7636
PIER(B)95	ELAT	N 39 01 16.36195	0 0 0.00000	N 39 01 16.36195
PIER(B)95	ELON	W 76 49 38.36406	0 0 0.00000	W 76 49 38.36406
PIER(B)95	EHYT	17.7529	0.0000	17.7529
PIER(C)95	ELAT	N 39 01 19.44860	0 0 0.00000	N 39 01 19.44860
PIER(C)95	ELON	W 76 49 37.49767	0 0 0.00000	W 76 49 37.49767
PIER(C)95	EHYT	12.6559	0.0000	12.6559
SGEOS	ELAT	N 39 01 12.63678	0 0 0.00000	N 39 01 12.63678
SGEOS	ELON	W 76 49 38.94125	0 0 0.00000	W 76 49 38.94125
SGEOS	EHYT	18.8667	0.0000	18.8667
SLR00(03)	ELAT	N 39 01 12.96614	0 0 0.00000	N 39 01 12.96614
SLR00(03)	ELON	W 76 49 38.92632	0 0 0.00000	W 76 49 38.92632
SLR00(03)	EHYT	22.1997	0.0000	22.1997
TLRS4(03)	ELAT	N 39 01 15.27142	0 0 0.00000	N 39 01 15.27142
TLRS4(03)	ELON	W 76 49 38.82207	0 0 0.00000	W 76 49 38.82207
TLRS4(03)	EHYT	21.2791	0.0000	21.2791

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                 GRS 80            UNITS: m,DMS          Page 0017
================================================================================
Adjusted PLH Coordinates:
                                    LATITUDE         LONGITUDE  ELIP-HEIGHT
 CODE FFF STATION                    STD DEV           STD DEV      STD DEV
 ---- --- ------------ ---------------- ---------------- ------------
 PLH  000 4005W        N 39  1  18.02098 W 76 49  37.51232      14.2397 m       0
                                   0.0005           0.0007       0.0004
 PLH  000 4006E        N 39  1  18.21820 W 76 49  36.58370      14.5087 m       0
                                   0.0005           0.0007       0.0004
 PLH  111 7105         N 39  1  14.17743 W 76 49  39.69784      19.1940 m       0
                                   0.0000           0.0000       0.0000
 PLH  000 7108(93)     N 39  1  18.93304 W 76 49  35.55077      13.7449 m       0
                                   0.0006           0.0008       0.0006
 PLH  000 7108RM1      N 39  1  18.36754 W 76 49  34.47588      13.3556 m       0
                                   0.0007           0.0007       0.0004
 PLH  000 7918ECC      N 39  1  14.58437 W 76 49  40.27827      18.7054 m       0
                                   0.0006           0.0006       0.0007
 PLH  000 CAL(A)01     N 39  1  15.63989 W 76 49  35.68958      16.4287 m       0
                                   0.0006           0.0006       0.0003
 PLH  000 CAL(B)01     N 39  1  14.35267 W 76 49  30.55668      16.1551 m       0
                                   0.0010           0.0006       0.0004
 PLH  000 CAL(B)02     N 39  1  13.63260 W 76 49  32.46975      16.9665 m       0
                                   0.0008           0.0006       0.0004
 PLH  000 CAL(C)01     N 39  1  12.74558 W 76 49  32.85656      17.3135 m       0
                                   0.0008           0.0006       0.0004
 PLH  000 CAL(D)98     N 39  1  12.14112 W 76 49  40.64590      19.8852 m       0
                                   0.0005           0.0006       0.0004
 PLH  000 DORIS GREB   N 39  1  12.25146 W 76 49  40.42722      20.4339 m       0
                                   0.0008           0.0008       0.0007
 PLH  000 DORIS PIER   N 39  1  12.25146 W 76 49  40.42722      19.9159 m       0
                                   0.0006           0.0007       0.0005
 PLH  000 GODDARD      N 39  1  14.77710 W 76 49  40.58620      18.0316 m       0
                                   0.0005           0.0006       0.0005
 PLH  000 GODDARD2     N 39  1  15.81023 W 76 49  39.87002      17.2804 m       0
                                   0.0005           0.0006       0.0005
 PLH  000 GORF89       N 39  1  12.78694 W 76 49  39.68449      18.3497 m       0
                                   0.0005           0.0006       0.0004
 PLH  000 MOB7(01)     N 39  1  14.17715 W 76 49  39.69919      22.3323 m       0
                                   0.0005           0.0006       0.0007
 PLH  000 MOB7(03)     N 39  1  14.17721 W 76 49  39.69920      22.3328 m       0
                                   0.0005           0.0006       0.0004
 PLH  000 MOB7(91)     N 39  1  14.17710 W 76 49  39.69917      22.3434 m       0
                                   0.0020           0.0020       0.0007
 PLH  000 MOB7(92)     N 39  1  14.17713 W 76 49  39.69912      22.3323 m       0
                                   0.0020           0.0020       0.0009
 PLH  000 MV3(02)      N 39  1  18.93418 W 76 49  35.55016      18.0712 m       0
                                   0.0014           0.0014       0.0014
 PLH  111 MV3(02PRE)   N 39  1  18.93314 W 76 49  35.55082      18.0970 m       0
                                   0.0000           0.0000       0.0000
 PLH  000 MV3(03)      N 39  1  18.93321 W 76 49  35.55076      16.8140 m       0
                                   0.0020           0.0020       0.0020
 PLH  111 MV3(03PRE)   N 39  1  18.93311 W 76 49  35.55097      17.0410 m       0
                                   0.0000           0.0000       0.0000
 PLH  000 MV3PED       N 39  1  18.93310 W 76 49  35.55091      17.1432 m       0
                                   0.0007           0.0009       0.5718
 PLH  000 NGEOS        N 39  1  15.43371 W 76 49  38.95938      18.9672 m       0
                                   0.0005           0.0006       0.0003
 PLH  000 PIER(A)95    N 39  1  19.91830 W 76 49  35.36083      13.7636 m       0
                                   0.0006           0.0008       0.0004
 PLH  000 PIER(B)95    N 39  1  16.36195 W 76 49  38.36406      17.7529 m       0
                                   0.0005           0.0006       0.0004
 PLH  000 PIER(C)95    N 39  1  19.44860 W 76 49  37.49767      12.6559 m       0
                                   0.0005           0.0008       0.0004
 PLH  000 SGEOS        N 39  1  12.63678 W 76 49  38.94125      18.8667 m       0
                                   0.0005           0.0006       0.0003
 PLH  000 SLR00(03)    N 39  1  12.96614 W 76 49  38.92632      22.1997 m       0
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0018
================================================================================
Adjusted PLH Coordinates:
                                 LATITUDE         LONGITUDE  ELIP-HEIGHT
 CODE FFF STATION                 STD DEV           STD DEV      STD DEV
 ---- --- ------------ ----------------- ----------------- ------------
                                  0.0006            0.0007       0.0006
 PLH  000 TLRS4(03)    N 39  1  15.27142 W 76 49  38.82207      21.2791 m       0
                                  0.0006            0.0006       0.0007
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0019
================================================================================
Adjusted XYZ Coordinates:
                          X-COORDINATE       Y-COORDINATE       Z-COORDINATE
 CODE FFF STATION              STD DEV            STD DEV            STD DEV
 ---- --- ------------ ------------------ ------------------ ------------------
 XYZ      4005W          1130752.9400      -4831262.1868      3994195.5046 m       0
                               0.0007             0.0004             0.0005
 XYZ      4006E          1130773.8656      -4831253.5710      3994200.3990 m       0
                               0.0007             0.0004             0.0005
 XYZ      7105           1130719.6320      -4831350.5771      3994106.5389 m       0
                               0.0000             0.0000             0.0000
 XYZ      7108(93)       1130794.7612      -4831233.8163      3994217.0443 m       0
                               0.0009             0.0005             0.0006
 XYZ      7108RM1        1130822.3712      -4831238.3198      3994203.2510 m       0
                               0.0008             0.0005             0.0006
 XYZ      7918ECC        1130704.1497      -4831345.6963      3994115.9809 m       0
                               0.0006             0.0007             0.0007
 XYZ      CAL(A)01       1130806.5567      -4831298.8643      3994139.8361 m       0
                               0.0006             0.0004             0.0005
 XYZ      CAL(B)01       1130932.4311      -4831294.8500      3994108.8240 m       0
                               0.0006             0.0007             0.0009
 XYZ      CAL(B)02       1130890.9518      -4831319.5653      3994092.0831 m       0
                               0.0006             0.0006             0.0007
 XYZ      CAL(C)01       1130885.8780      -4831338.7171      3994071.0499 m       0
                               0.0006             0.0006             0.0007
 XYZ      CAL(D)98       1130706.5572      -4831394.7927      3994058.1869 m       0
                               0.0006             0.0004             0.0005
 XYZ      DORIS GREB     1130711.2883      -4831391.9232      3994061.1759 m       0
                               0.0008             0.0007             0.0007
 XYZ      DORIS PIER     1130711.1966      -4831391.5313      3994060.8498 m       0
                               0.0007             0.0005             0.0006
 XYZ      GODDARD        1130695.9650      -4831343.2311      3994120.1741 m       0
                               0.0006             0.0005             0.0005
 XYZ      GODDARD2       1130708.0361      -4831319.2056      3994144.4535 m       0
                               0.0006             0.0005             0.0005
 XYZ      GORF89         1130725.9473      -4831376.1519      3994072.6932 m       0
                               0.0006             0.0004             0.0005
 XYZ      MOB7(01)       1130720.1573      -4831352.9638      3994108.5081 m       0
                               0.0006             0.0006             0.0006
 XYZ      MOB7(03)       1130720.1568      -4831352.9632      3994108.5099 m       0
                               0.0006             0.0005             0.0005
 XYZ      MOB7(91)       1130720.1599      -4831352.9730      3994108.5139 m       0
                               0.0019             0.0014             0.0016
 XYZ      MOB7(92)       1130720.1591      -4831352.9639      3994108.5075 m       0
                               0.0019             0.0014             0.0016
 XYZ      MV3(02)        1130795.5363      -4831237.0641      3994219.7956 m       0
                               0.0014             0.0014             0.0014
 XYZ      MV3(02PRE)     1130795.5301      -4831237.1069      3994219.7869 m       0
                               0.0000             0.0000             0.0000
 XYZ      MV3(03)        1130795.3040      -4831236.1348      3994218.9808 m       0
                               0.0020             0.0020             0.0020
 XYZ      MV3(03PRE)     1130795.3397      -4831236.3095      3994219.1214 m       0
                               0.0000             0.0000             0.0000
 XYZ      MV3PED         1130795.3593      -4831236.3866      3994219.1855 m       0
                               0.1012             0.4325             0.3600
 XYZ      NGEOS          1130731.3304      -4831322.6077      3994136.4947 m       0
                               0.0006             0.0003             0.0004
 XYZ      PIER(A)95      1130794.8536      -4831214.1626      3994240.6611 m       0
                               0.0009             0.0004             0.0005
 XYZ      PIER(B)95      1130740.9524      -4831300.8775      3994157.9692 m       0
                               0.0006             0.0004             0.0004
 XYZ      PIER(C)95      1130746.6858      -4831233.9190      3994228.7106 m       0
                               0.0008             0.0004             0.0005
 XYZ      SGEOS          1130744.1121      -4831375.3072      3994069.4211 m       0
                               0.0006             0.0004             0.0004
 XYZ      SLR00(03)      1130743.5948      -4831371.5205      3994079.4104 m       0
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS           Page 0020
================================================================================
Adjusted XYZ Coordinates:
                            X-COORDINATE       Y-COORDINATE       Z-COORDINATE
 CODE FFF STATION                STD DEV            STD DEV            STD DEV
 ---- --- ------------ ------------------ ------------------ ------------------
                                   0.0007             0.0006             0.0006
 XYZ      TLRS4(03)          1130735.6739      -4831326.6719      3994134.0621 m       0
                                   0.0007             0.0007             0.0006
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0021

Geoid Values:

CODE	STATION	N/S DEFLECTION	E/W DEFLECTION	UNDULATION
GEOI	4005W	- 0 0 1.67	0 0 6.38	-32.3591 m
GEOI	4006E	- 0 0 1.68	0 0 6.38	-32.3599 m
GEOI	7105	- 0 0 1.67	0 0 6.38	-32.3586 m
GEOI	7108(93)	- 0 0 1.68	0 0 6.39	-32.3606 m
GEOI	7108RM1	- 0 0 1.68	0 0 6.39	-32.3614 m
GEOI	7918ECC	- 0 0 1.67	0 0 6.38	-32.3579 m
GEOI	CAL(A)01	- 0 0 1.68	0 0 6.39	-32.3614 m
GEOI	CAL(B)01	- 0 0 1.69	0 0 6.41	-32.3654 m
GEOI	CAL(B)02	- 0 0 1.69	0 0 6.41	-32.3642 m
GEOI	CAL(C)01	- 0 0 1.69	0 0 6.41	-32.3644 m
GEOI	CAL(D)98	- 0 0 1.67	0 0 6.38	-32.3584 m
GEOI	DORIS GREB	- 0 0 1.67	0 0 6.38	-32.3584 m
GEOI	DORIS PIER	- 0 0 1.67	0 0 6.38	-32.3584 m
GEOI	GODDARD	- 0 0 1.67	0 0 6.38	-32.3579 m
GEOI	GODDARD2	- 0 0 1.67	0 0 6.38	-32.3584 m
GEOI	GORF89	- 0 0 1.67	0 0 6.39	-32.3591 m
GEOI	MOB7(01)	- 0 0 1.67	0 0 6.38	-32.3586 m
GEOI	MOB7(03)	- 0 0 1.67	0 0 6.38	-32.3586 m
GEOI	MOB7(91)	- 0 0 1.67	0 0 6.38	-32.3586 m
GEOI	MOB7(92)	- 0 0 1.67	0 0 6.38	-32.3586 m
GEOI	MV3(02)	- 0 0 1.68	0 0 6.39	-32.3606 m
GEOI	MV3(02PRE)	- 0 0 1.68	0 0 6.39	-32.3606 m
GEOI	MV3(03)	- 0 0 1.68	0 0 6.39	-32.3606 m
GEOI	MV3(03PRE)	- 0 0 1.68	0 0 6.39	-32.3606 m
GEOI	MV3PED	- 0 0 1.68	0 0 6.39	-32.3606 m
GEOI	NGEOS	- 0 0 1.67	0 0 6.38	-32.3591 m
GEOI	PIER(A)95	- 0 0 1.68	0 0 6.38	-32.3604 m
GEOI	PIER(B)95	- 0 0 1.67	0 0 6.38	-32.3589 m
GEOI	PIER(C)95	- 0 0 1.67	0 0 6.38	-32.3589 m
GEOI	SGEOS	- 0 0 1.68	0 0 6.39	-32.3599 m
GEOI	SLR00(03)	- 0 0 1.68	0 0 6.39	-32.3599 m
GEOI	TLRS4(03)	- 0 0 1.67	0 0 6.38	-32.3591 m

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0022
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO                     STD DEV  STD DEV      PPM
---- ----------- ------------ ------------ ----------------- -------- --------
GROUP: DISTANCES
DIST             GODDARD      NGEOS              44.07164   0.0010   0.9495
                                                    0.0010   0.0010    22.03
DIST             GODDARD      NGEOS              44.07214   0.0005   0.4605
                                                    0.0010   0.0010    10.68
DIST             GODDARD      MOB7(03)           28.56599  -0.0001  -0.0728
                                                    0.0010   0.0010     2.51
DIST             GODDARD      MOB7(03)           28.56609  -0.0002  -0.1744
                                                    0.0010   0.0010     6.01
DIST             GODDARD      PIER(B)95          72.43064  -0.0002  -0.2283
                                                    0.0010   0.0010     3.22
DIST             GODDARD      PIER(B)95          72.43024   0.0002   0.1631
                                                    0.0010   0.0010     2.30
DIST             GODDARD      NGEOS              44.07185   0.0008   0.7403
                                                    0.0010   0.0010    17.17
DIST             GODDARD      NGEOS              44.07365  -0.0010  -1.0202
                                                    0.0010   0.0010    23.67
DIST             GODDARD      PIER(B)95          72.43072  -0.0003  -0.2998
                                                    0.0010   0.0010     4.23
DIST             GODDARD      PIER(B)95          72.43182  -0.0014  -1.3762
                                                    0.0010   0.0010    19.42
DIST             GODDARD      NGEOS              44.07100   0.0016   0.5101
                                                    0.0032   0.0032    36.55
DIST             GODDARD      4006E             143.33006  -0.0001  -0.1376
                                                    0.0011   0.0010     0.98
DIST             GODDARD      4006E             143.33046  -0.0005  -0.5287
                                                    0.0011   0.0010     3.77
DIST             GODDARD      PIER(B)95          72.42950   0.0009   0.2882
                                                    0.0032   0.0032    12.58
DIST             GODDARD      TLRS4(03)          45.20845   0.0008   0.8490
                                                    0.0010   0.0010    18.37
DIST             GODDARD      TLRS4(03)          45.20965  -0.0004  -0.3780
                                                    0.0010   0.0010     8.18
DIST             GODDARD2     7105               50.55840   0.0000  -0.0416
                                                    0.0010   0.0009     0.75
DIST             GODDARD2     7105               50.55720   0.0012   0.3699
                                                    0.0032   0.0031    22.87
DIST             GODDARD2     NGEOS              24.85025   0.0001   0.0757
                                                    0.0010   0.0010     3.07
DIST             GODDARD2     NGEOS              24.85035   0.0000  -0.0237
                                                    0.0010   0.0010     0.96
DIST             GODDARD2     MOB7(03)           50.77869  -0.0005  -0.5061
                                                    0.0010   0.0010     9.85
DIST             GODDARD2     MOB7(03)           50.77869  -0.0005  -0.5061
                                                    0.0010   0.0010     9.85
DIST             GODDARD2     NGEOS              24.85026   0.0001   0.0713
                                                    0.0010   0.0010     2.89
DIST             GODDARD2     NGEOS              24.85166  -0.0013  -1.3202
                                                    0.0010   0.0010    53.45
DIST             GODDARD2     TLRS4(03)          30.45621  -0.0001  -0.1211
                                                    0.0010   0.0010     3.84
DIST             GODDARD2     TLRS4(03)          30.45771  -0.0016  -1.6756
                                                    0.0010   0.0010    53.09
DIST             GODDARD2     PIER(B)95          40.02900  -0.0030  -0.9564
                                                    0.0032   0.0031    75.15
DIST             GORF89       CAL(B)02          175.51260  -0.0006  -0.5316
                                                    0.0011   0.0010     3.14
DIST             GORF89       CAL(B)02          175.51290  -0.0009  -0.8208
                                                    0.0011   0.0010     4.85
DIST             GORF89       SGEOS              18.47576   0.0007   0.7235
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0023
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    40.05
DIST              GORF89       SGEOS                  18.47586   0.0006   0.6257
                                                         0.0010   0.0010    34.64
DIST              GORF89       NGEOS                  83.46623  -0.0001  -0.1161
                                                         0.0010   0.0010     1.41
DIST              GORF89       NGEOS                  83.46593   0.0002   0.1795
                                                         0.0010   0.0010     2.18
DIST              GORF89       CAL(D)98               30.55987  -0.0003  -0.3192
                                                         0.0010   0.0010    10.56
DIST              GORF89       CAL(D)98               30.56017  -0.0006  -0.6159
                                                         0.0010   0.0010    20.38
DIST              GORF89       NGEOS                  83.46536   0.0008   0.7502
                                                         0.0010   0.0010     9.12
DIST              GORF89       NGEOS                  83.46486   0.0013   1.2430
                                                         0.0010   0.0010    15.11
DIST              GORF89       SGEOS                  18.47636   0.0001   0.1371
                                                         0.0010   0.0010     7.59
DIST              GORF89       SGEOS                  18.47676  -0.0003  -0.2541
                                                         0.0010   0.0010    14.06
DIST              GORF89       CAL(A)01              130.30480   0.0003   0.3265
                                                         0.0011   0.0010     2.57
DIST              GORF89       CAL(A)01              130.30470   0.0004   0.4240
                                                         0.0011   0.0010     3.34
DIST              GORF89       CAL(D)98               30.55897   0.0006   0.5737
                                                         0.0010   0.0010    18.98
DIST              GORF89       CAL(D)98               30.55947   0.0001   0.0791
                                                         0.0010   0.0010     2.62
DIST              GORF89       CAL(B)02              175.51216  -0.0001  -0.1133
                                                         0.0011   0.0010     0.67
DIST              GORF89       CAL(B)02              175.51216  -0.0001  -0.1133
                                                         0.0011   0.0010     0.67
DIST              GORF89       GODDARD                65.09400  -0.0006  -0.1780
                                                         0.0032   0.0031     8.59
DIST              GORF89       NGEOS                  83.46500   0.0011   0.3534
                                                         0.0032   0.0032    13.38
DIST              NGEOS        7108(93)              135.63168  -0.0012  -1.1705
                                                         0.0011   0.0010     8.84
DIST              NGEOS        7108(93)              135.63116  -0.0007  -0.2138
                                                         0.0032   0.0032     5.01
DIST              NGEOS        7108(93)              135.63111  -0.0006  -0.6135
                                                         0.0011   0.0010     4.63
DIST              NGEOS        7108(93)              135.63141  -0.0009  -0.9063
                                                         0.0011   0.0010     6.85
DIST              NGEOS        7105                   42.62028   0.0000   0.0108
                                                         0.0010   0.0009     0.24
DIST              NGEOS        7105                   42.62158  -0.0013  -0.4118
                                                         0.0032   0.0031    30.28
DIST              NGEOS        CAL(C)01              168.60564  -0.0010  -1.0040
                                                         0.0011   0.0010     6.22
DIST              NGEOS        CAL(C)01              168.60594  -0.0013  -1.2913
                                                         0.0011   0.0010     8.00
DIST              NGEOS        PIER(B)95              32.03239  -0.0021  -2.0123
                                                         0.0010   0.0010    65.14
DIST              NGEOS        PIER(B)95              32.03239  -0.0021  -2.0123
                                                         0.0010   0.0010    65.14
DIST              NGEOS        CAL(B)01              204.88549  -0.0010  -0.9413
                                                         0.0011   0.0010     4.73
DIST              NGEOS        CAL(B)01              204.88579  -0.0013  -1.2325
                                                         0.0011   0.0010     6.20
DIST              NGEOS        MOB7(01)               42.77443  -0.0009  -0.8729
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0024
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                     STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                       0.0010   0.0010    20.80
DIST              NGEOS        MOB7(01)            42.77463  -0.0011  -1.0691
                                                       0.0010   0.0010    25.48
DIST              NGEOS        PIER(A)95          163.23765  -0.0011  -1.0210
                                                       0.0011   0.0010     6.54
DIST              NGEOS        PIER(A)95          163.23745  -0.0009  -0.8297
                                                       0.0011   0.0010     5.31
DIST              NGEOS        CAL(A)01            78.95515   0.0000   0.0447
                                                       0.0010   0.0010     0.59
DIST              NGEOS        CAL(A)01            78.95485   0.0003   0.3347
                                                       0.0010   0.0010     4.39
DIST              NGEOS        7108RM1            140.88748   0.0000   0.0149
                                                       0.0011   0.0010     0.11
DIST              NGEOS        7108RM1            140.88678   0.0007   0.6898
                                                       0.0011   0.0010     5.08
DIST              NGEOS        PIER(A)95          163.23815  -0.0016  -1.4966
                                                       0.0011   0.0010     9.58
DIST              NGEOS        PIER(A)95          163.23695  -0.0004  -0.3484
                                                       0.0011   0.0010     2.23
DIST              NGEOS        PIER(B)95           32.02985   0.0005   0.4411
                                                       0.0010   0.0010    14.28
DIST              NGEOS        PIER(B)95           32.02945   0.0009   0.8269
                                                       0.0010   0.0010    26.77
DIST              NGEOS        PIER(C)95          128.86152  -0.0002  -0.1671
                                                       0.0011   0.0010     1.35
DIST              NGEOS        PIER(C)95          128.86042   0.0009   0.8908
                                                       0.0011   0.0010     7.19
DIST              NGEOS        4005W               87.17649   0.0006   0.5348
                                                       0.0010   0.0010     6.34
DIST              NGEOS        4005W               87.17599   0.0011   1.0185
                                                       0.0010   0.0010    12.08
DIST              NGEOS        PIER(C)95          128.86281  -0.0015  -1.4015
                                                       0.0011   0.0010    11.31
DIST              NGEOS        PIER(C)95          128.86181  -0.0005  -0.4397
                                                       0.0011   0.0010     3.55
DIST              NGEOS        4006E              103.24364  -0.0009  -0.8413
                                                       0.0010   0.0010     8.44
DIST              NGEOS        4006E              103.24264   0.0001   0.1247
                                                       0.0010   0.0010     1.25
DIST              NGEOS        PIER(B)95           32.02855   0.0018   1.6909
                                                       0.0010   0.0010    54.74
DIST              NGEOS        PIER(B)95           32.02825   0.0021   1.9802
                                                       0.0010   0.0010    64.10
DIST              NGEOS        CAL(B)02           165.71256   0.0000  -0.0409
                                                       0.0011   0.0010     0.26
DIST              NGEOS        CAL(B)02           165.71276  -0.0002  -0.2323
                                                       0.0011   0.0010     1.46
DIST              NGEOS        CAL(C)01           168.60429   0.0003   0.2864
                                                       0.0011   0.0010     1.77
DIST              NGEOS        CAL(C)01           168.60429   0.0003   0.2864
                                                       0.0011   0.0010     1.77
DIST              NGEOS        MOB7(01)            42.77199   0.0015   1.5193
                                                       0.0010   0.0010    36.20
DIST              NGEOS        MOB7(01)            42.77199   0.0015   1.5193
                                                       0.0010   0.0010    36.20
DIST              NGEOS        GORF89              83.46552   0.0006   0.5911
                                                       0.0010   0.0010     7.18
DIST              NGEOS        GORF89              83.46502   0.0011   1.0839
                                                       0.0010   0.0010    13.18
DIST              NGEOS        GODDARD             44.07134   0.0013   1.2406
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0025
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    28.78
DIST              NGEOS        GODDARD                44.07274  -0.0001  -0.1286
                                                         0.0010   0.0010     2.98
DIST              NGEOS        GODDARD                44.07103   0.0016   1.5465
                                                         0.0010   0.0010    35.88
DIST              NGEOS        GODDARD                44.07153   0.0011   1.0575
                                                         0.0010   0.0010    24.53
DIST              NGEOS        GODDARD2               24.84886   0.0015   1.4651
                                                         0.0010   0.0010    59.32
DIST              NGEOS        GODDARD2               24.84956   0.0008   0.7694
                                                         0.0010   0.0010    31.15
DIST              NGEOS        PIER(B)95              32.02964   0.0007   0.6395
                                                         0.0010   0.0010    20.70
DIST              NGEOS        PIER(B)95              32.02994   0.0004   0.3502
                                                         0.0010   0.0010    11.34
DIST              NGEOS        MOB7(03)               42.77106   0.0011   1.0400
                                                         0.0010   0.0010    24.57
DIST              NGEOS        MOB7(03)               42.77076   0.0014   1.3369
                                                         0.0010   0.0010    31.58
DIST              NGEOS        GODDARD                44.07113   0.0015   1.4488
                                                         0.0010   0.0010    33.61
DIST              NGEOS        GODDARD                44.07243   0.0002   0.1773
                                                         0.0010   0.0010     4.11
DIST              NGEOS        GODDARD2               24.84881   0.0015   1.5129
                                                         0.0010   0.0010    61.25
DIST              NGEOS        GODDARD2               24.84981   0.0005   0.5189
                                                         0.0010   0.0010    21.01
DIST              NGEOS        PIER(B)95              32.02974   0.0006   0.5436
                                                         0.0010   0.0010    17.60
DIST              NGEOS        PIER(B)95              32.03084  -0.0005  -0.5173
                                                         0.0010   0.0010    16.74
DIST              NGEOS        TLRS4(03)               6.42516   0.0015   1.4831
                                                         0.0010   0.0010   227.45
DIST              NGEOS        TLRS4(03)               6.42666   0.0000  -0.0388
                                                         0.0010   0.0010     5.95
DIST              NGEOS        SGEOS                  86.25400  -0.0016  -0.5041
                                                         0.0032   0.0032    18.47
DIST              NGEOS        CAL(B)02              165.71400  -0.0015  -0.4653
                                                         0.0032   0.0032     8.98
DIST              NGEOS        CAL(B)02              165.71400  -0.0015  -0.4653
                                                         0.0032   0.0032     8.98
DIST              NGEOS        4005W                  87.17702   0.0000   0.0232
                                                         0.0010   0.0010     0.27
DIST              NGEOS        4005W                  87.17772  -0.0007  -0.6540
                                                         0.0010   0.0010     7.76
DIST              NGEOS        7108RM1               140.88714   0.0004   0.3456
                                                         0.0011   0.0010     2.54
DIST              NGEOS        7108RM1               140.88814  -0.0006  -0.6185
                                                         0.0011   0.0010     4.55
DIST              NGEOS        PIER(B)95              32.03010   0.0002   0.2022
                                                         0.0010   0.0010     6.55
DIST              NGEOS        PIER(B)95              32.03090  -0.0006  -0.5694
                                                         0.0010   0.0010    18.43
DIST              NGEOS        CAL(B)02              165.71335  -0.0008  -0.7994
                                                         0.0011   0.0010     5.04
DIST              NGEOS        CAL(B)02              165.71495  -0.0024  -2.3309
                                                         0.0011   0.0010    14.69
DIST              NGEOS        4006E                 103.24243   0.0003   0.3263
                                                         0.0010   0.0010     3.27
DIST              NGEOS        4006E                 103.24283  -0.0001  -0.0601
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0026
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010     0.60
DIST              NGEOS        4005W                  87.17531   0.0017   1.6826
                                                         0.0010   0.0010    19.95
DIST              NGEOS        4005W                  87.17531   0.0017   1.6826
                                                         0.0010   0.0010    19.95
DIST              NGEOS        PIER(A)95             163.23728  -0.0007  -0.6637
                                                         0.0011   0.0010     4.25
DIST              NGEOS        PIER(A)95             163.23688  -0.0003  -0.2810
                                                         0.0011   0.0010     1.80
DIST              NGEOS        PIER(B)95              32.02948   0.0008   0.7999
                                                         0.0010   0.0010    25.89
DIST              NGEOS        PIER(B)95              32.02928   0.0010   0.9928
                                                         0.0010   0.0010    32.14
DIST              NGEOS        PIER(C)95             128.86072   0.0006   0.6015
                                                         0.0011   0.0010     4.85
DIST              NGEOS        PIER(C)95             128.86002   0.0013   1.2748
                                                         0.0011   0.0010    10.29
DIST              NGEOS        GORF89                 83.46545   0.0007   0.6597
                                                         0.0010   0.0010     8.02
DIST              NGEOS        GORF89                 83.46505   0.0011   1.0540
                                                         0.0010   0.0010    12.81
DIST              NGEOS        CAL(B)02              165.71180   0.0007   0.6858
                                                         0.0011   0.0010     4.32
DIST              NGEOS        CAL(B)02              165.71190   0.0006   0.5901
                                                         0.0011   0.0010     3.72
DIST              NGEOS        CAL(C)01              168.60256   0.0020   1.9462
                                                         0.0011   0.0010    12.05
DIST              NGEOS        CAL(C)01              168.60236   0.0022   2.1377
                                                         0.0011   0.0010    13.24
DIST              NGEOS        CAL(B)02              165.71138   0.0011   1.0799
                                                         0.0011   0.0010     6.81
DIST              NGEOS        CAL(B)02              165.71038   0.0021   2.0371
                                                         0.0011   0.0010    12.84
DIST              SGEOS        7105                   50.87931  -0.0012  -1.2754
                                                         0.0010   0.0009    22.99
DIST              SGEOS        7105                   50.87861  -0.0005  -0.1510
                                                         0.0032   0.0031     9.28
DIST              SGEOS        GORF89                 18.47550   0.0010   0.9748
                                                         0.0010   0.0010    53.96
DIST              SGEOS        GORF89                 18.47540   0.0011   1.0726
                                                         0.0010   0.0010    59.37
DIST              SGEOS        CAL(B)02              158.69058  -0.0003  -0.3164
                                                         0.0011   0.0010     2.06
DIST              SGEOS        CAL(B)02              158.69058  -0.0003  -0.3164
                                                         0.0011   0.0010     2.06
DIST              SGEOS        GORF89                 18.47547   0.0010   1.0053
                                                         0.0010   0.0010    55.64
DIST              SGEOS        GORF89                 18.47577   0.0007   0.7119
                                                         0.0010   0.0010    39.41
DIST              SGEOS        CAL(A)01              121.24743   0.0007   0.7172
                                                         0.0011   0.0010     6.05
DIST              SGEOS        CAL(A)01              121.24743   0.0007   0.7172
                                                         0.0011   0.0010     6.05
DIST              SGEOS        CAL(D)98               43.77501   0.0001   0.1319
                                                         0.0010   0.0010     3.05
DIST              SGEOS        CAL(D)98               43.77521  -0.0001  -0.0660
                                                         0.0010   0.0010     1.52
DIST              SGEOS        CAL(B)02              158.69004   0.0002   0.2112
                                                         0.0011   0.0010     1.38
DIST              SGEOS        CAL(B)02              158.68994   0.0003   0.3078
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0027
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0011   0.0010     2.01
DIST              SGEOS        CAL(A)01              121.24806   0.0001   0.1010
                                                         0.0011   0.0010     0.85
DIST              SGEOS        CAL(A)01              121.24836  -0.0002  -0.1921
                                                         0.0011   0.0010     1.62
DIST              SGEOS        CAL(C)01              146.41875   0.0021   2.0141
                                                         0.0011   0.0010    14.04
DIST              SGEOS        CAL(C)01              146.41905   0.0018   1.7201
                                                         0.0011   0.0010    11.99
DIST              SGEOS        CAL(B)02              158.69001   0.0002   0.2316
                                                         0.0011   0.0010     1.51
DIST              SGEOS        CAL(B)02              158.68961   0.0006   0.6182
                                                         0.0011   0.0010     4.03
DIST              SGEOS        NGEOS                  86.25420  -0.0018  -0.5674
                                                         0.0032   0.0032    20.79
DIST              SGEOS        SLR00(03)              10.69729  -0.0018  -1.9242
                                                         0.0010   0.0010   171.61
DIST              7105         NGEOS                  42.62020   0.0001   0.0293
                                                         0.0032   0.0031     2.15
DIST              7105         SGEOS                  50.87689   0.0012   0.3993
                                                         0.0032   0.0031    24.53
DIST              7105         NGEOS                  42.62016   0.0001   0.1398
                                                         0.0010   0.0009     3.10
DIST              7105         SGEOS                  50.87737   0.0008   0.8430
                                                         0.0010   0.0009    15.19
DIST              7918ECC      GODDARD2               39.08236   0.0015   1.5786
                                                         0.0010   0.0009    37.45
DIST              7918ECC      GODDARD2               39.08266   0.0012   1.2550
                                                         0.0010   0.0009    29.77
DIST              7918ECC      CAL(A)01              115.10684  -0.0003  -0.3116
                                                         0.0011   0.0010     2.68
DIST              7918ECC      CAL(A)01              115.10704  -0.0005  -0.5132
                                                         0.0011   0.0010     4.42
DIST              7918ECC      CAL(C)01              187.32991   0.0005   0.5148
                                                         0.0011   0.0010     2.77
DIST              7918ECC      CAL(C)01              187.32981   0.0006   0.6139
                                                         0.0011   0.0010     3.31
DIST              7918ECC      CAL(D)98               75.86974   0.0012   1.2226
                                                         0.0010   0.0010    15.53
DIST              7918ECC      CAL(D)98               75.86984   0.0011   1.1189
                                                         0.0010   0.0010    14.21
DIST              7918ECC      CAL(B)02              190.12964  -0.0009  -0.8544
                                                         0.0011   0.0010     4.56
DIST              7918ECC      CAL(B)02              190.12794   0.0008   0.8194
                                                         0.0011   0.0010     4.38
DIST              7108(93)     4006E                  33.22630  -0.0007  -0.6705
                                                         0.0010   0.0010    20.37
DIST              7108(93)     4005W                  54.93512  -0.0001  -0.0953
                                                         0.0010   0.0010     1.75
DIST              7108(93)     NGEOS                 135.63199  -0.0015  -1.4745
                                                         0.0011   0.0010    11.14
DIST              7108(93)     4006E                  33.22525   0.0004   0.1200
                                                         0.0032   0.0032    11.39
DIST              7108(93)     4005W                  54.93473   0.0003   0.0928
                                                         0.0032   0.0032     5.33
DIST              7108(93)     NGEOS                 135.63178  -0.0013  -0.4107
                                                         0.0032   0.0032     9.63
DIST              7108(93)     PIER(B)95             104.31900   0.0000   0.0229
                                                         0.0010   0.0010     0.22
DIST              7108(93)     PIER(C)95              49.47174  -0.0010  -1.0003
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0028
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    19.86
DIST              7108(93)     7108RM1               31.19157  -0.0010  -1.0276
                                                         0.0010   0.0010    32.09
DIST              7108(93)     CAL(A)01             101.64407  -0.0002  -0.1589
                                                         0.0010   0.0010     1.57
DIST              4005W        NGEOS                 87.17877  -0.0017  -1.6698
                                                         0.0010   0.0010    19.80
DIST              4005W        NGEOS                 87.17897  -0.0019  -1.8633
                                                         0.0010   0.0010    22.10
DIST              4005W        PIER(C)95             44.05492  -0.0002  -0.2056
                                                         0.0010   0.0010     4.81
DIST              4005W        PIER(C)95             44.05582  -0.0011  -1.0794
                                                         0.0010   0.0010    25.24
DIST              4005W        PIER(B)95             55.22334  -0.0003  -0.3089
                                                         0.0010   0.0010     5.77
DIST              4005W        PIER(B)95             55.22284   0.0002   0.1756
                                                         0.0010   0.0010     3.28
DIST              4005W        4006E                 23.15197   0.0012   1.1259
                                                         0.0010   0.0010    49.94
DIST              4005W        4006E                 23.15247   0.0007   0.6390
                                                         0.0010   0.0010    28.34
DIST              4005W        PIER(B)95             55.22076   0.0023   2.1910
                                                         0.0010   0.0010    40.94
DIST              4005W        PIER(B)95             55.22086   0.0022   2.0941
                                                         0.0010   0.0010    39.13
DIST              4005W        PIER(C)95             44.05514  -0.0004  -0.4207
                                                         0.0010   0.0010     9.84
DIST              4005W        PIER(C)95             44.05574  -0.0010  -1.0032
                                                         0.0010   0.0010    23.46
DIST              4005W        7108RM1               73.82843  -0.0020  -1.9863
                                                         0.0010   0.0010    27.67
DIST              4005W        7108RM1               73.82823  -0.0018  -1.7918
                                                         0.0010   0.0010    24.96
DIST              4005W        NGEOS                 87.17637   0.0007   0.6563
                                                         0.0010   0.0010     7.78
DIST              4005W        NGEOS                 87.17637   0.0007   0.6563
                                                         0.0010   0.0010     7.78
DIST              4005W        4006E                 23.15132   0.0018   1.7632
                                                         0.0010   0.0010    78.20
DIST              4005W        4006E                 23.15082   0.0023   2.2501
                                                         0.0010   0.0010    99.80
DIST              4005W        PIER(B)95             55.22244   0.0006   0.5609
                                                         0.0010   0.0010    10.48
DIST              4005W        PIER(B)95             55.22244   0.0006   0.5609
                                                         0.0010   0.0010    10.48
DIST              4005W        PIER(C)95             44.05303   0.0017   1.6299
                                                         0.0010   0.0010    38.11
DIST              4005W        PIER(C)95             44.05363   0.0011   1.0474
                                                         0.0010   0.0010    24.49
DIST              4005W        7108RM1               73.82403   0.0024   2.2904
                                                         0.0010   0.0010    31.91
DIST              4005W        7108RM1               73.82393   0.0025   2.3876
                                                         0.0010   0.0010    33.26
DIST              4005W        7108(93)              54.93404   0.0010   0.9759
                                                         0.0010   0.0010    17.90
DIST              4006E        PIER(B)95             71.56527  -0.0008  -0.8182
                                                         0.0010   0.0010    11.80
DIST              4006E        PIER(B)95             71.56557  -0.0011  -1.1087
                                                         0.0010   0.0010    15.99
DIST              4006E        NGEOS                103.24469  -0.0019  -1.8617
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0029
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    18.67
DIST              4006E        NGEOS                 103.24479  -0.0020  -1.9583
                                                         0.0010   0.0010    19.64
DIST              4006E        PIER(C)95              43.89155   0.0002   0.2366
                                                         0.0010   0.0010     5.55
DIST              4006E        PIER(C)95              43.89225  -0.0005  -0.4433
                                                         0.0010   0.0010    10.40
DIST              4006E        4005W                  23.15387  -0.0007  -0.7250
                                                         0.0010   0.0010    32.16
DIST              4006E        4005W                  23.15437  -0.0012  -1.2119
                                                         0.0010   0.0010    53.75
DIST              4006E        NGEOS                 103.24216   0.0006   0.5886
                                                         0.0010   0.0010     5.90
DIST              4006E        NGEOS                 103.24246   0.0003   0.2988
                                                         0.0010   0.0010     3.00
DIST              4006E        4005W                  23.15147   0.0017   1.6114
                                                         0.0010   0.0010    71.47
DIST              4006E        4005W                  23.15137   0.0018   1.7088
                                                         0.0010   0.0010    75.79
DIST              4006E        PIER(B)95              71.56353   0.0009   0.8688
                                                         0.0010   0.0010    12.53
DIST              4006E        PIER(B)95              71.56393   0.0005   0.4814
                                                         0.0010   0.0010     6.94
DIST              4006E        PIER(A)95              60.12117   0.0000   0.0189
                                                         0.0010   0.0010     0.32
DIST              4006E        PIER(A)95              60.12177  -0.0006  -0.5645
                                                         0.0010   0.0010     9.66
DIST              4006E        PIER(C)95              43.89101   0.0008   0.7552
                                                         0.0010   0.0010    17.72
DIST              4006E        PIER(C)95              43.89181   0.0000  -0.0217
                                                         0.0010   0.0010     0.51
DIST              4006E        7108RM1                50.92577   0.0009   0.9195
                                                         0.0010   0.0010    18.50
DIST              4006E        7108RM1                50.92637   0.0003   0.3338
                                                         0.0010   0.0010     6.72
DIST              4006E        GODDARD               143.33083  -0.0009  -0.8965
                                                         0.0011   0.0010     6.40
DIST              4006E        GODDARD               143.33133  -0.0014  -1.3855
                                                         0.0011   0.0010     9.89
DIST              4006E        7108(93)               33.22563   0.0000   0.0013
                                                         0.0010   0.0010     0.04
DIST              PIER(A)95    CAL(A)01              132.20281  -0.0021  -2.0415
                                                         0.0011   0.0010    15.98
DIST              PIER(A)95    CAL(A)01              132.20121  -0.0005  -0.4949
                                                         0.0011   0.0010     3.87
DIST              PIER(A)95    CAL(C)01              229.27700  -0.0016  -1.5244
                                                         0.0011   0.0010     6.88
DIST              PIER(A)95    CAL(C)01              229.27650  -0.0011  -1.0411
                                                         0.0011   0.0010     4.70
DIST              PIER(A)95    NGEOS                 163.23574   0.0009   0.8150
                                                         0.0011   0.0010     5.22
DIST              PIER(A)95    NGEOS                 163.23574   0.0009   0.8150
                                                         0.0011   0.0010     5.22
DIST              PIER(A)95    PIER(B)95             131.38849  -0.0007  -0.6401
                                                         0.0011   0.0010     5.07
DIST              PIER(A)95    PIER(B)95             131.38889  -0.0011  -1.0246
                                                         0.0011   0.0010     8.11
DIST              PIER(A)95    PIER(C)95              53.41605  -0.0001  -0.0801
                                                         0.0010   0.0010     1.54
DIST              PIER(A)95    PIER(C)95              53.41605  -0.0001  -0.0801
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0030
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010     1.54
DIST              PIER(A)95    4006E                  60.12018   0.0010   0.9829
                                                         0.0010   0.0010    16.82
DIST              PIER(A)95    4006E                  60.11978   0.0014   1.3718
                                                         0.0010   0.0010    23.47
DIST              PIER(A)95    4006E                  60.12135  -0.0002  -0.1478
                                                         0.0010   0.0010     2.53
DIST              PIER(A)95    4006E                  60.12175  -0.0006  -0.5367
                                                         0.0010   0.0010     9.18
DIST              PIER(A)95    NGEOS                 163.23511   0.0015   1.4148
                                                         0.0011   0.0010     9.06
DIST              PIER(A)95    NGEOS                 163.23471   0.0019   1.7975
                                                         0.0011   0.0010    11.51
DIST              PIER(A)95    NGEOS                 163.23489   0.0017   1.6258
                                                         0.0011   0.0010    10.41
DIST              PIER(A)95    NGEOS                 163.23469   0.0019   1.8172
                                                         0.0011   0.0010    11.63
DIST              PIER(A)95    PIER(B)95             131.38713   0.0007   0.6693
                                                         0.0011   0.0010     5.30
DIST              PIER(A)95    PIER(B)95             131.38723   0.0006   0.5732
                                                         0.0011   0.0010     4.54
DIST              PIER(A)95    PIER(C)95              53.41538   0.0006   0.5724
                                                         0.0010   0.0010    11.01
DIST              PIER(A)95    PIER(C)95              53.41518   0.0008   0.7670
                                                         0.0010   0.0010    14.76
DIST              PIER(A)95    7108RM1                52.34748   0.0005   0.4836
                                                         0.0010   0.0010     9.44
DIST              PIER(A)95    7108RM1                52.34748   0.0005   0.4836
                                                         0.0010   0.0010     9.44
DIST              PIER(A)95    MV3PED                 30.90616   0.0028   2.9454
                                                         0.0010   0.0009    90.47
DIST              PIER(A)95    MV3PED                 30.90606   0.0029   3.0508
                                                         0.0010   0.0009    93.71
DIST              PIER(A)95    CAL(A)01              132.19986   0.0008   0.8034
                                                         0.0011   0.0010     6.29
DIST              PIER(A)95    CAL(A)01              132.19956   0.0011   1.0934
                                                         0.0011   0.0010     8.56
DIST              PIER(A)95    7108RM1                52.34862  -0.0006  -0.6307
                                                         0.0010   0.0010    12.31
DIST              PIER(A)95    7108RM1                52.34822  -0.0002  -0.2392
                                                         0.0010   0.0010     4.67
DIST              PIER(A)95    PIER(B)95             131.38785   0.0000  -0.0241
                                                         0.0011   0.0010     0.19
DIST              PIER(A)95    PIER(B)95             131.38785   0.0000  -0.0241
                                                         0.0011   0.0010     0.19
DIST              PIER(A)95    PIER(C)95              53.41678  -0.0008  -0.7832
                                                         0.0010   0.0010    15.07
DIST              PIER(A)95    PIER(C)95              53.41658  -0.0006  -0.5886
                                                         0.0010   0.0010    11.32
DIST              PIER(A)95    NGEOS                 163.23670  -0.0001  -0.1065
                                                         0.0011   0.0010     0.68
DIST              PIER(A)95    NGEOS                 163.23630   0.0003   0.2762
                                                         0.0011   0.0010     1.77
DIST              PIER(A)95    CAL(A)01              132.20058   0.0001   0.1085
                                                         0.0011   0.0010     0.85
DIST              PIER(A)95    CAL(A)01              132.20018   0.0005   0.4952
                                                         0.0011   0.0010     3.87
DIST              PIER(B)95    7108(93)              104.32043  -0.0014  -1.3820
                                                         0.0010   0.0010    13.52
DIST              PIER(B)95    7108(93)              104.32063  -0.0016  -1.5779
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0031
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    15.44
DIST              PIER(B)95    NGEOS                32.03180  -0.0015  -1.4365
                                                         0.0010   0.0010    46.50
DIST              PIER(B)95    NGEOS                32.03190  -0.0016  -1.5329
                                                         0.0010   0.0010    49.62
DIST              PIER(B)95    CAL(A)01             68.09622  -0.0022  -2.1491
                                                         0.0010   0.0010    32.65
DIST              PIER(B)95    CAL(A)01             68.09182   0.0022   2.1040
                                                         0.0010   0.0010    31.97
DIST              PIER(B)95    CAL(A)01             68.09192   0.0021   2.0074
                                                         0.0010   0.0010    30.50
DIST              PIER(B)95    CAL(A)01             68.09282   0.0012   1.1374
                                                         0.0010   0.0010    17.28
DIST              PIER(B)95    CAL(A)01             68.09262   0.0014   1.3307
                                                         0.0010   0.0010    20.22
DIST              PIER(B)95    CAL(B)01            197.77735  -0.0005  -0.4998
                                                         0.0011   0.0010     2.59
DIST              PIER(B)95    CAL(B)01            197.77675   0.0001   0.0853
                                                         0.0011   0.0010     0.44
DIST              PIER(B)95    CAL(C)01            173.17802  -0.0011  -1.0952
                                                         0.0011   0.0010     6.60
DIST              PIER(B)95    CAL(C)01            173.17752  -0.0006  -0.6162
                                                         0.0011   0.0010     3.71
DIST              PIER(B)95    4005W                55.22169   0.0013   1.2916
                                                         0.0010   0.0010    24.14
DIST              PIER(B)95    4005W                55.22189   0.0011   1.0978
                                                         0.0010   0.0010    20.51
DIST              PIER(B)95    MOB7(01)             74.77997  -0.0015  -1.4984
                                                         0.0010   0.0010    20.49
DIST              PIER(B)95    MOB7(01)             74.78067  -0.0022  -2.1829
                                                         0.0010   0.0010    29.85
DIST              PIER(B)95    4005W                55.22087   0.0022   2.0837
                                                         0.0010   0.0010    38.94
DIST              PIER(B)95    4005W                55.22077   0.0023   2.1806
                                                         0.0010   0.0010    40.75
DIST              PIER(B)95    PIER(C)95            97.57568  -0.0018  -1.7733
                                                         0.0010   0.0010    18.85
DIST              PIER(B)95    PIER(C)95            97.57558  -0.0017  -1.6769
                                                         0.0010   0.0010    17.82
DIST              PIER(B)95    PIER(A)95           131.38898  -0.0012  -1.1108
                                                         0.0011   0.0010     8.79
DIST              PIER(B)95    PIER(A)95           131.38908  -0.0013  -1.2069
                                                         0.0011   0.0010     9.56
DIST              PIER(B)95    7108RM1             112.21999  -0.0018  -1.7234
                                                         0.0011   0.0010    15.88
DIST              PIER(B)95    7108RM1             112.21959  -0.0014  -1.3365
                                                         0.0011   0.0010    12.31
DIST              PIER(B)95    CAL(A)01             68.09260   0.0014   1.3518
                                                         0.0010   0.0010    20.54
DIST              PIER(B)95    CAL(A)01             68.09140   0.0026   2.5118
                                                         0.0010   0.0010    38.16
DIST              PIER(B)95    CAL(B)02            164.89349   0.0005   0.4608
                                                         0.0011   0.0010     2.91
DIST              PIER(B)95    CAL(B)02            164.89339   0.0006   0.5567
                                                         0.0011   0.0010     3.52
DIST              PIER(B)95    PIER(A)95           131.38895  -0.0011  -1.0809
                                                         0.0011   0.0010     8.56
DIST              PIER(B)95    PIER(A)95           131.38925  -0.0014  -1.3693
                                                         0.0011   0.0010    10.84
DIST              PIER(B)95    SLR00(03)           105.68404  -0.0010  -1.0675
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0032
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                        0.0010   0.0009     9.58
DIST              PIER(B)95    4005W                 55.22514  -0.0021  -2.0612
                                                        0.0010   0.0010    38.52
DIST              PIER(B)95    4005W                 55.22504  -0.0020  -1.9643
                                                        0.0010   0.0010    36.71
DIST              PIER(B)95    PIER(C)95             97.57402  -0.0002  -0.1729
                                                        0.0010   0.0010     1.84
DIST              PIER(B)95    PIER(C)95             97.57402  -0.0002  -0.1729
                                                        0.0010   0.0010     1.84
DIST              PIER(B)95    4006E                 71.56343   0.0010   0.9651
                                                        0.0010   0.0010    13.92
DIST              PIER(B)95    4006E                 71.56383   0.0006   0.5776
                                                        0.0010   0.0010     8.33
DIST              PIER(B)95    MOB7(01)              74.77739   0.0010   1.0243
                                                        0.0010   0.0010    14.01
DIST              PIER(B)95    MOB7(01)              74.77789   0.0005   0.5354
                                                        0.0010   0.0010     7.32
DIST              PIER(B)95    4006E                 71.56445   0.0000  -0.0263
                                                        0.0010   0.0010     0.38
DIST              PIER(B)95    4006E                 71.56415   0.0003   0.2643
                                                        0.0010   0.0010     3.81
DIST              PIER(B)95    NGEOS                 32.02881   0.0015   1.4436
                                                        0.0010   0.0010    46.73
DIST              PIER(B)95    NGEOS                 32.02871   0.0016   1.5401
                                                        0.0010   0.0010    49.85
DIST              PIER(B)95    7108(93)             104.32020  -0.0012  -1.1471
                                                        0.0010   0.0010    11.23
DIST              PIER(B)95    CAL(A)01              68.09343   0.0006   0.5451
                                                        0.0010   0.0010     8.28
DIST              PIER(B)95    CAL(A)01              68.09283   0.0012   1.1251
                                                        0.0010   0.0010    17.09
DIST              PIER(B)95    MOB7(01)              74.77747   0.0010   0.9517
                                                        0.0010   0.0010    13.02
DIST              PIER(B)95    MOB7(01)              74.77747   0.0010   0.9517
                                                        0.0010   0.0010    13.02
DIST              PIER(B)95    CAL(B)02             164.89465  -0.0007  -0.6459
                                                        0.0011   0.0010     4.08
DIST              PIER(B)95    CAL(B)02             164.89465  -0.0007  -0.6459
                                                        0.0011   0.0010     4.08
DIST              PIER(B)95    CAL(A)01              68.09357   0.0004   0.4152
                                                        0.0010   0.0010     6.31
DIST              PIER(B)95    CAL(A)01              68.09297   0.0010   0.9952
                                                        0.0010   0.0010    15.12
DIST              PIER(B)95    GODDARD               72.43039   0.0000   0.0204
                                                        0.0010   0.0010     0.29
DIST              PIER(B)95    GODDARD               72.43009   0.0003   0.3140
                                                        0.0010   0.0010     4.43
DIST              PIER(B)95    NGEOS                 32.03026   0.0000   0.0400
                                                        0.0010   0.0010     1.29
DIST              PIER(B)95    NGEOS                 32.03016   0.0001   0.1364
                                                        0.0010   0.0010     4.42
DIST              PIER(B)95    TLRS4(03)             35.56338   0.0002   0.1643
                                                        0.0010   0.0010     4.54
DIST              PIER(B)95    TLRS4(03)             35.56338   0.0002   0.1643
                                                        0.0010   0.0010     4.54
DIST              PIER(B)95    NGEOS                 32.02879   0.0015   1.4603
                                                        0.0010   0.0010    47.27
DIST              PIER(B)95    NGEOS                 32.02859   0.0017   1.6531
                                                        0.0010   0.0010    53.51
DIST              PIER(B)95    PIER(A)95            131.38857  -0.0007  -0.7098
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS           Page 0033
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                        0.0011   0.0010     5.62
DIST              PIER(B)95    PIER(A)95           131.38857  -0.0007  -0.7098
                                                        0.0011   0.0010     5.62
DIST              PIER(B)95    PIER(C)95            97.57330   0.0005   0.5239
                                                        0.0010   0.0010     5.57
DIST              PIER(B)95    PIER(C)95            97.57330   0.0005   0.5239
                                                        0.0010   0.0010     5.57
DIST              PIER(B)95    PIER(C)95            97.57300   0.0008   0.8132
                                                        0.0010   0.0010     8.64
DIST              PIER(B)95    PIER(C)95            97.57280   0.0010   1.0061
                                                        0.0010   0.0010    10.69
DIST              PIER(B)95    CAL(A)01             68.09311   0.0009   0.8600
                                                        0.0010   0.0010    13.07
DIST              PIER(B)95    CAL(A)01             68.09251   0.0015   1.4400
                                                        0.0010   0.0010    21.88
DIST              PIER(B)95    SGEOS               115.72000  -0.0025  -0.7990
                                                        0.0032   0.0032    21.88
DIST              PIER(B)95    PIER(C)95            97.57400  -0.0002  -0.0495
                                                        0.0032   0.0032     1.61
DIST              PIER(B)95    CAL(C)01            173.17800  -0.0011  -0.3512
                                                        0.0032   0.0032     6.49
DIST              PIER(B)95    CAL(B)02            164.89600  -0.0020  -0.6345
                                                        0.0032   0.0032    12.30
DIST              PIER(C)95    PIER(A)95            53.41580   0.0002   0.1693
                                                        0.0010   0.0010     3.26
DIST              PIER(C)95    PIER(A)95            53.41560   0.0004   0.3639
                                                        0.0010   0.0010     7.00
DIST              PIER(C)95    4005W                44.05568  -0.0010  -0.9436
                                                        0.0010   0.0010    22.06
DIST              PIER(C)95    4005W                44.05638  -0.0017  -1.6232
                                                        0.0010   0.0010    37.95
DIST              PIER(C)95    NGEOS               128.86351  -0.0022  -2.0816
                                                        0.0011   0.0010    16.80
DIST              PIER(C)95    PIER(B)95            97.57522  -0.0014  -1.3312
                                                        0.0010   0.0010    14.15
DIST              PIER(C)95    PIER(B)95            97.57542  -0.0016  -1.5240
                                                        0.0010   0.0010    16.20
DIST              PIER(C)95    4006E                43.88911   0.0027   2.6043
                                                        0.0010   0.0010    61.10
DIST              PIER(C)95    4006E                43.88991   0.0019   1.8273
                                                        0.0010   0.0010    42.87
DIST              PIER(C)95    4006E                43.89166   0.0001   0.1281
                                                        0.0010   0.0010     3.00
DIST              PIER(C)95    4006E                43.89236  -0.0006  -0.5517
                                                        0.0010   0.0010    12.94
DIST              PIER(C)95    PIER(A)95            53.41590   0.0001   0.0720
                                                        0.0010   0.0010     1.39
DIST              PIER(C)95    PIER(A)95            53.41550   0.0005   0.4612
                                                        0.0010   0.0010     8.87
DIST              PIER(C)95    7108RM1              79.97623  -0.0022  -2.1581
                                                        0.0010   0.0010    27.75
DIST              PIER(C)95    7108RM1              79.97613  -0.0021  -2.0609
                                                        0.0010   0.0010    26.50
DIST              PIER(C)95    4005W                44.05576  -0.0010  -1.0170
                                                        0.0010   0.0010    23.78
DIST              PIER(C)95    4005W                44.05626  -0.0015  -1.5024
                                                        0.0010   0.0010    35.13
DIST              PIER(C)95    PIER(B)95            97.57327   0.0006   0.5481
                                                        0.0010   0.0010     5.83
DIST              PIER(C)95    PIER(B)95            97.57297   0.0009   0.8374
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0034
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010     8.90
DIST              PIER(C)95    NGEOS                128.85945   0.0019   1.8269
                                                         0.0011   0.0010    14.74
DIST              PIER(C)95    NGEOS                128.85895   0.0024   2.3078
                                                         0.0011   0.0010    18.62
DIST              PIER(C)95    MV3PED                49.65806   0.0000   0.0158
                                                         0.0010   0.0010     0.30
DIST              PIER(C)95    MV3PED                49.65836  -0.0003  -0.2998
                                                         0.0010   0.0010     5.74
DIST              PIER(C)95    NGEOS                128.86154  -0.0002  -0.1865
                                                         0.0011   0.0010     1.51
DIST              PIER(C)95    NGEOS                128.86094   0.0004   0.3905
                                                         0.0011   0.0010     3.15
DIST              PIER(C)95    7108(93)              49.47138  -0.0006  -0.6343
                                                         0.0010   0.0010    12.59
DIST              PIER(C)95    4005W                 44.05254   0.0022   2.1100
                                                         0.0010   0.0010    49.33
DIST              PIER(C)95    4005W                 44.05314   0.0016   1.5275
                                                         0.0010   0.0010    35.71
DIST              PIER(C)95    PIER(A)95             53.41534   0.0006   0.6133
                                                         0.0010   0.0010    11.80
DIST              PIER(C)95    PIER(A)95             53.41524   0.0007   0.7106
                                                         0.0010   0.0010    13.67
DIST              PIER(C)95    PIER(B)95             97.57273   0.0011   1.0749
                                                         0.0010   0.0010    11.42
DIST              PIER(C)95    PIER(B)95             97.57263   0.0012   1.1713
                                                         0.0010   0.0010    12.45
DIST              PIER(C)95    7108RM1               79.97175   0.0023   2.2026
                                                         0.0010   0.0010    28.32
DIST              PIER(C)95    7108RM1               79.97175   0.0023   2.2026
                                                         0.0010   0.0010    28.32
DIST              PIER(C)95    CAL(B)02             216.36700   0.0008   0.2509
                                                         0.0032   0.0032     3.73
DIST              7108RM1      PIER(B)95            112.22065  -0.0024  -2.3635
                                                         0.0011   0.0010    21.77
DIST              7108RM1      PIER(B)95            112.22045  -0.0022  -2.1701
                                                         0.0011   0.0010    19.99
DIST              7108RM1      PIER(C)95             79.97554  -0.0015  -1.4845
                                                         0.0010   0.0010    19.09
DIST              7108RM1      PIER(C)95             79.97554  -0.0015  -1.4845
                                                         0.0010   0.0010    19.09
DIST              7108RM1      PIER(A)95             52.34916  -0.0012  -1.1633
                                                         0.0010   0.0010    22.70
DIST              7108RM1      PIER(A)95             52.34916  -0.0012  -1.1633
                                                         0.0010   0.0010    22.70
DIST              7108RM1      4005W                 73.82796  -0.0016  -1.5322
                                                         0.0010   0.0010    21.34
DIST              7108RM1      4005W                 73.82816  -0.0018  -1.7267
                                                         0.0010   0.0010    24.05
DIST              7108RM1      NGEOS                140.88670   0.0008   0.7732
                                                         0.0011   0.0010     5.69
DIST              7108RM1      NGEOS                140.88620   0.0013   1.2553
                                                         0.0011   0.0010     9.24
DIST              7108RM1      NGEOS                140.88492   0.0026   2.4852
                                                         0.0011   0.0010    18.30
DIST              7108RM1      NGEOS                140.88482   0.0027   2.5816
                                                         0.0011   0.0010    19.00
DIST              7108RM1      4005W                 73.82461   0.0018   1.7297
                                                         0.0010   0.0010    24.10
DIST              7108RM1      4005W                 73.82461   0.0018   1.7297
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0035
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    24.10
DIST              7108RM1      PIER(A)95             52.34687   0.0011   1.0830
                                                         0.0010   0.0010    21.13
DIST              7108RM1      PIER(A)95             52.34667   0.0013   1.2788
                                                         0.0010   0.0010    24.95
DIST              7108RM1      PIER(B)95            112.21630   0.0019   1.8468
                                                         0.0011   0.0010    17.01
DIST              7108RM1      PIER(B)95            112.21580   0.0024   2.3305
                                                         0.0011   0.0010    21.47
DIST              7108RM1      PIER(C)95             79.97268   0.0013   1.2941
                                                         0.0010   0.0010    16.64
DIST              7108RM1      PIER(C)95             79.97278   0.0012   1.1968
                                                         0.0010   0.0010    15.39
DIST              7108RM1      MV3PED                31.41783   0.0034   3.5679
                                                         0.0010   0.0009   107.61
DIST              7108RM1      MV3PED                31.41803   0.0032   3.3568
                                                         0.0010   0.0009   101.24
DIST              7108RM1      7108(93)              31.19156  -0.0010  -1.0193
                                                         0.0010   0.0010    31.83
DIST              7108RM1      4006E                 50.92612   0.0006   0.5780
                                                         0.0010   0.0010    11.63
DIST              7108RM1      4006E                 50.92642   0.0003   0.2852
                                                         0.0010   0.0010     5.74
DIST              CAL(A)01     CAL(B)01             129.70118  -0.0007  -0.6702
                                                         0.0011   0.0010     5.24
DIST              CAL(A)01     CAL(B)01             129.69928   0.0012   1.2031
                                                         0.0011   0.0010     9.41
DIST              CAL(A)01     CAL(C)01             112.30251  -0.0009  -0.8938
                                                         0.0011   0.0010     8.24
DIST              CAL(A)01     CAL(C)01             112.30251  -0.0009  -0.8938
                                                         0.0011   0.0010     8.24
DIST              CAL(A)01     CAL(C)01             112.30091   0.0007   0.6521
                                                         0.0011   0.0010     6.01
DIST              CAL(A)01     CAL(C)01             112.29961   0.0020   1.9082
                                                         0.0011   0.0010    17.59
DIST              CAL(A)01     PIER(B)95             68.09570  -0.0017  -1.6475
                                                         0.0010   0.0010    25.03
DIST              CAL(A)01     PIER(B)95             68.09580  -0.0018  -1.7442
                                                         0.0010   0.0010    26.50
DIST              CAL(A)01     MOB7(01)             106.64355   0.0010   0.9584
                                                         0.0010   0.0010     9.29
DIST              CAL(A)01     CAL(B)02              99.15322   0.0002   0.1870
                                                         0.0010   0.0010     1.95
DIST              CAL(A)01     CAL(B)02              99.15252   0.0009   0.8650
                                                         0.0010   0.0010     9.01
DIST              CAL(A)01     MOB7(01)             106.64495  -0.0004  -0.3953
                                                         0.0010   0.0010     3.83
DIST              CAL(A)01     MOB7(01)             106.64515  -0.0006  -0.5887
                                                         0.0010   0.0010     5.71
DIST              CAL(A)01     PIER(A)95            132.20069   0.0000   0.0036
                                                         0.0011   0.0010     0.03
DIST              CAL(A)01     PIER(A)95            132.20029   0.0004   0.3903
                                                         0.0011   0.0010     3.05
DIST              CAL(A)01     CAL(C)01             112.30153   0.0001   0.0602
                                                         0.0011   0.0010     0.55
DIST              CAL(A)01     CAL(C)01             112.30263  -0.0010  -1.0027
                                                         0.0011   0.0010     9.24
DIST              CAL(A)01     CAL(C)01             112.30163   0.0000  -0.0365
                                                         0.0011   0.0010     0.34
DIST              CAL(A)01     MOB7(01)             106.64258   0.0020   1.9052
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0036
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    18.48
DIST              CAL(A)01     MOB7(01)               106.64398   0.0006   0.5515
                                                         0.0010   0.0010     5.35
DIST              CAL(A)01     MOB7(01)               106.64278   0.0018   1.7118
                                                         0.0010   0.0010    16.60
DIST              CAL(A)01     PIER(B)95               68.09343   0.0006   0.5452
                                                         0.0010   0.0010     8.28
DIST              CAL(A)01     PIER(A)95              132.20218  -0.0015  -1.4399
                                                         0.0011   0.0010    11.27
DIST              CAL(A)01     PIER(A)95              132.20148  -0.0008  -0.7633
                                                         0.0011   0.0010     5.97
DIST              CAL(A)01     NGEOS                   78.95258   0.0026   2.5270
                                                         0.0010   0.0010    33.11
DIST              CAL(A)01     NGEOS                   78.95268   0.0025   2.4303
                                                         0.0010   0.0010    31.84
DIST              CAL(A)01     PIER(B)95               68.09282   0.0012   1.1351
                                                         0.0010   0.0010    17.24
DIST              CAL(A)01     MOB7(01)               106.64507  -0.0005  -0.5051
                                                         0.0010   0.0010     4.90
DIST              CAL(A)01     MOB7(01)               106.64507  -0.0005  -0.5051
                                                         0.0010   0.0010     4.90
DIST              CAL(A)01     7108(93)               101.64439  -0.0005  -0.4807
                                                         0.0010   0.0010     4.74
DIST              CAL(A)01     CAL(C)01               112.29991   0.0017   1.6245
                                                         0.0011   0.0010    14.97
DIST              CAL(A)01     CAL(C)01               112.30011   0.0015   1.4313
                                                         0.0011   0.0010    13.19
DIST              CAL(A)01     MOB7(03)               106.64539  -0.0013  -1.2542
                                                         0.0010   0.0010    11.90
DIST              CAL(A)01     MOB7(03)               106.64559  -0.0015  -1.4518
                                                         0.0010   0.0010    13.78
DIST              CAL(A)01     CAL(B)02                99.15311   0.0003   0.2943
                                                         0.0010   0.0010     3.06
DIST              CAL(A)01     CAL(B)02                99.15271   0.0007   0.6817
                                                         0.0010   0.0010     7.10
DIST              CAL(A)01     SLR00(03)              113.55381  -0.0003  -0.3515
                                                         0.0011   0.0010     2.95
DIST              CAL(B)01     NGEOS                  204.88425   0.0003   0.2636
                                                         0.0011   0.0010     1.33
DIST              CAL(B)01     NGEOS                  204.88455   0.0000  -0.0275
                                                         0.0011   0.0010     0.14
DIST              CAL(B)01     PIER(B)95              197.77751  -0.0007  -0.6615
                                                         0.0011   0.0010     3.43
DIST              CAL(B)01     PIER(B)95              197.77741  -0.0006  -0.5640
                                                         0.0011   0.0010     2.92
DIST              CAL(B)01     CAL(A)01               129.70164  -0.0011  -1.1203
                                                         0.0011   0.0010     8.76
DIST              CAL(B)01     CAL(A)01               129.70114  -0.0006  -0.6274
                                                         0.0011   0.0010     4.91
DIST              CAL(B)01     CAL(C)01                74.28586   0.0000   0.0341
                                                         0.0010   0.0010     0.45
DIST              CAL(B)01     CAL(C)01                74.28646  -0.0006  -0.5778
                                                         0.0010   0.0010     7.63
DIST              CAL(B)01     MOB7(01)               220.08445   0.0007   0.6955
                                                         0.0011   0.0010     3.26
DIST              CAL(B)01     MOB7(01)               220.08325   0.0019   1.8597
                                                         0.0011   0.0010     8.71
DIST              CAL(C)01     PIER(B)95              173.17864  -0.0018  -1.6945
                                                         0.0011   0.0010    10.21
DIST              CAL(C)01     PIER(B)95              173.17724  -0.0004  -0.3531
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0037
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0011   0.0010     2.13
DIST              CAL(C)01     NGEOS                 168.60526  -0.0007  -0.6425
                                                         0.0011   0.0010     3.98
DIST              CAL(C)01     NGEOS                 168.60616  -0.0016  -1.5045
                                                         0.0011   0.0010     9.32
DIST              CAL(C)01     CAL(B)01               74.28596  -0.0001  -0.0617
                                                         0.0010   0.0010     0.81
DIST              CAL(C)01     CAL(B)01               74.28586   0.0000   0.0403
                                                         0.0010   0.0010     0.53
DIST              CAL(C)01     MOB7(01)              170.49750   0.0001   0.1162
                                                         0.0011   0.0010     0.71
DIST              CAL(C)01     MOB7(01)              170.49670   0.0009   0.8843
                                                         0.0011   0.0010     5.40
DIST              CAL(C)01     PIER(A)95             229.27642  -0.0010  -0.9586
                                                         0.0011   0.0010     4.33
DIST              CAL(C)01     PIER(A)95             229.27522   0.0002   0.2012
                                                         0.0011   0.0010     0.91
DIST              CAL(C)01     MOB7(01)              170.49724   0.0004   0.3730
                                                         0.0011   0.0010     2.28
DIST              CAL(C)01     MOB7(01)              170.49774  -0.0001  -0.1070
                                                         0.0011   0.0010     0.65
DIST              CAL(C)01     MOB7(01)              170.49754   0.0001   0.0850
                                                         0.0011   0.0010     0.52
DIST              CAL(C)01     CAL(A)01              112.30118   0.0004   0.3935
                                                         0.0011   0.0010     3.63
DIST              CAL(C)01     CAL(A)01              112.30218  -0.0006  -0.5728
                                                         0.0011   0.0010     5.28
DIST              CAL(C)01     CAL(A)01              112.30128   0.0003   0.2968
                                                         0.0011   0.0010     2.74
DIST              CAL(C)01     CAL(B)02               28.89389   0.0012   1.2167
                                                         0.0010   0.0010    42.42
DIST              CAL(C)01     CAL(B)02               28.89339   0.0017   1.7130
                                                         0.0010   0.0010    59.73
DIST              CAL(C)01     CAL(A)01              112.30033   0.0013   1.2147
                                                         0.0011   0.0010    11.20
DIST              CAL(C)01     CAL(A)01              112.29993   0.0017   1.6012
                                                         0.0011   0.0010    14.76
DIST              CAL(C)01     NGEOS                 168.60376   0.0008   0.7967
                                                         0.0011   0.0010     4.93
DIST              CAL(C)01     NGEOS                 168.60366   0.0009   0.8925
                                                         0.0011   0.0010     5.53
DIST              CAL(C)01     MOB7(01)              170.49814  -0.0005  -0.4932
                                                         0.0011   0.0010     3.01
DIST              CAL(C)01     MOB7(01)              170.49894  -0.0013  -1.2612
                                                         0.0011   0.0010     7.70
DIST              CAL(C)01     SLR00(03)             146.25461   0.0002   0.1973
                                                         0.0011   0.0010     1.30
DIST              CAL(C)01     MOB7(01)              170.49911  -0.0015  -1.4298
                                                         0.0011   0.0010     8.73
DIST              CAL(C)01     MOB7(01)              170.49911  -0.0015  -1.4298
                                                         0.0011   0.0010     8.73
DIST              CAL(C)01     PIER(C)95             234.97700  -0.0004  -0.1293
                                                         0.0032   0.0032     1.78
DIST              CAL(D)98     SLR00(03)              48.62117  -0.0021  -2.2238
                                                         0.0010   0.0009    42.86
DIST              CAL(D)98     CAL(C)01              188.32316   0.0007   0.6952
                                                         0.0011   0.0010     3.75
DIST              CAL(D)98     CAL(C)01              188.32236   0.0015   1.4826
                                                         0.0011   0.0010     8.00
DIST              CAL(D)98     CAL(B)02              202.01404  -0.0005  -0.5200
```

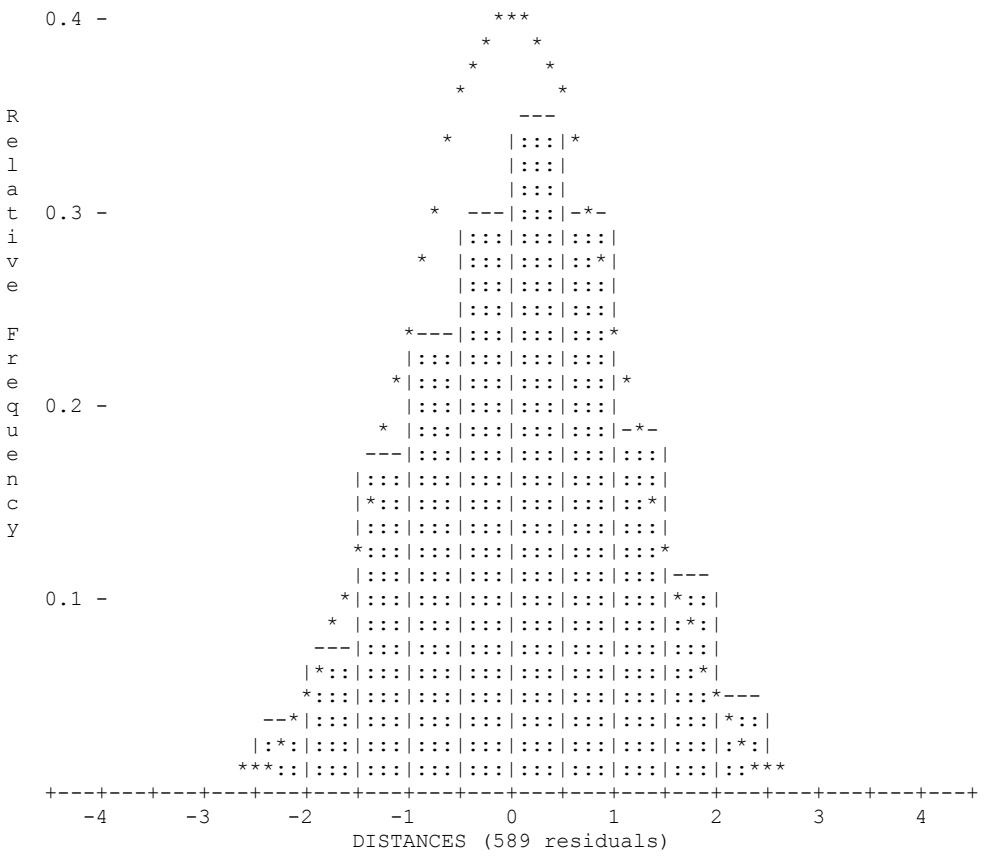
```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0038
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                        0.0011   0.0010     2.65
DIST              CAL(D)98     CAL(B)02               202.01384  -0.0003  -0.3257
                                                        0.0011   0.0010     1.66
DIST              CAL(D)98     7918ECC                 75.87115  -0.0002  -0.2407
                                                        0.0010   0.0010     3.06
DIST              CAL(D)98     7918ECC                 75.87115  -0.0002  -0.2407
                                                        0.0010   0.0010     3.06
DIST              MOB7(01)     CAL(C)01               170.49819  -0.0006  -0.5428
                                                        0.0011   0.0010     3.32
DIST              MOB7(01)     CAL(C)01               170.49879  -0.0012  -1.1189
                                                        0.0011   0.0010     6.83
DIST              MOB7(01)     CAL(B)01               220.08544  -0.0003  -0.2669
                                                        0.0011   0.0010     1.25
DIST              MOB7(01)     CAL(B)01               220.08474   0.0004   0.4122
                                                        0.0011   0.0010     1.93
DIST              MOB7(01)     CAL(A)01               106.64671  -0.0022  -2.0955
                                                        0.0010   0.0010    20.32
DIST              MOB7(01)     CAL(A)01               106.64661  -0.0021  -1.9988
                                                        0.0010   0.0010    19.38
DIST              MOB7(01)     NGEOS                   42.77417  -0.0006  -0.6185
                                                        0.0010   0.0010    14.74
DIST              MOB7(01)     NGEOS                   42.77447  -0.0009  -0.9128
                                                        0.0010   0.0010    21.75
DIST              MOB7(01)     PIER(B)95               74.77976  -0.0013  -1.2931
                                                        0.0010   0.0010    17.68
DIST              MOB7(01)     PIER(B)95               74.78066  -0.0022  -2.1731
                                                        0.0010   0.0010    29.72
DIST              MOB7(01)     CAL(A)01               106.64369   0.0009   0.8302
                                                        0.0010   0.0010     8.05
DIST              MOB7(01)     CAL(A)01               106.64479  -0.0002  -0.2334
                                                        0.0010   0.0010     2.26
DIST              MOB7(01)     CAL(A)01               106.64379   0.0008   0.7335
                                                        0.0010   0.0010     7.11
DIST              MOB7(01)     CAL(C)01               170.49732   0.0003   0.2909
                                                        0.0011   0.0010     1.78
DIST              MOB7(01)     CAL(C)01               170.49882  -0.0012  -1.1492
                                                        0.0011   0.0010     7.02
DIST              MOB7(01)     CAL(C)01               170.49782  -0.0002  -0.1891
                                                        0.0011   0.0010     1.16
DIST              MOB7(03)     CAL(A)01               106.64448  -0.0004  -0.3566
                                                        0.0010   0.0010     3.38
DIST              MOB7(03)     CAL(A)01               106.64458  -0.0005  -0.4554
                                                        0.0010   0.0010     4.32
DIST              MOB7(03)     CAL(C)01               170.49892  -0.0005  -0.4931
                                                        0.0011   0.0010     2.92
DIST              MOB7(03)     CAL(C)01               170.49952  -0.0011  -1.0871
                                                        0.0011   0.0010     6.44
DIST              MOB7(03)     PIER(B)95               74.77803  -0.0010  -1.0068
                                                        0.0010   0.0010    13.60
DIST              MOB7(03)     PIER(B)95               74.77843  -0.0014  -1.4028
                                                        0.0010   0.0010    18.95
DIST              MOB7(03)     CAL(B)02               174.80452  -0.0013  -1.2800
                                                        0.0011   0.0010     7.44
DIST              MOB7(03)     CAL(B)02               174.80512  -0.0019  -1.8702
                                                        0.0011   0.0010    10.88
DIST              MOB7(01)     CAL(C)01               170.49682   0.0008   0.7735
                                                        0.0011   0.0010     4.73
DIST              MOB7(01)     CAL(C)01               170.49702   0.0006   0.5815
                                                        0.0011   0.0010     3.55
DIST              MOB7(01)     CAL(A)01               106.64420   0.0003   0.3360
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0039
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010     3.26
DIST              MOB7(01)     CAL(A)01              106.64410   0.0004   0.4327
                                                         0.0010   0.0010     4.20
DIST              MOB7(01)     CAL(A)01              106.64395   0.0006   0.5795
                                                         0.0010   0.0010     5.62
DIST              MOB7(01)     CAL(A)01              106.64395   0.0006   0.5795
                                                         0.0010   0.0010     5.62
DIST              MOB7(01)     PIER(B)95              74.77805   0.0004   0.3790
                                                         0.0010   0.0010     5.18
DIST              MOB7(01)     PIER(B)95              74.77845   0.0000  -0.0122
                                                         0.0010   0.0010     0.17
DIST              MOB7(01)     CAL(B)02              174.80274   0.0000  -0.0359
                                                         0.0011   0.0010     0.21
DIST              MOB7(01)     CAL(B)02              174.80294  -0.0002  -0.2285
                                                         0.0011   0.0010     1.36
DIST              MOB7(01)     CAL(C)01              170.49728   0.0003   0.3289
                                                         0.0011   0.0010     2.01
DIST              MOB7(01)     CAL(C)01              170.49758   0.0000   0.0408
                                                         0.0011   0.0010     0.25
DIST              MOB7(03)     GODDARD                28.56593   0.0000  -0.0140
                                                         0.0010   0.0010     0.48
DIST              MOB7(03)     GODDARD                28.56613  -0.0002  -0.2173
                                                         0.0010   0.0010     7.48
DIST              MOB7(03)     GODDARD2               50.77822   0.0000  -0.0221
                                                         0.0010   0.0010     0.43
DIST              MOB7(03)     GODDARD2               50.77852  -0.0003  -0.3256
                                                         0.0010   0.0010     6.34
DIST              MOB7(03)     NGEOS                  42.77091   0.0012   1.1816
                                                         0.0010   0.0010    27.91
DIST              MOB7(03)     NGEOS                  42.77091   0.0012   1.1816
                                                         0.0010   0.0010    27.91
DIST              MOB7(03)     TLRS4(03)              39.81087   0.0003   0.2682
                                                         0.0010   0.0010     6.55
DIST              MOB7(03)     TLRS4(03)              39.80977   0.0014   1.3998
                                                         0.0010   0.0010    34.18
DIST              CAL(B)02     CAL(C)01               28.89361   0.0015   1.4906
                                                         0.0010   0.0010    51.97
DIST              CAL(B)02     CAL(C)01               28.89411   0.0010   0.9943
                                                         0.0010   0.0010    34.67
DIST              CAL(B)02     CAL(A)01               99.15227   0.0012   1.1164
                                                         0.0010   0.0010    11.63
DIST              CAL(B)02     CAL(A)01               99.15237   0.0011   1.0196
                                                         0.0010   0.0010    10.62
DIST              CAL(B)02     PIER(B)95             164.89245   0.0015   1.4565
                                                         0.0011   0.0010     9.21
DIST              CAL(B)02     PIER(B)95             164.89265   0.0013   1.2646
                                                         0.0011   0.0010     7.99
DIST              CAL(B)02     NGEOS                 165.71186   0.0007   0.6254
                                                         0.0011   0.0010     3.94
DIST              CAL(B)02     NGEOS                 165.71196   0.0006   0.5296
                                                         0.0011   0.0010     3.34
DIST              CAL(B)02     MOB7(01)              174.80374  -0.0010  -0.9969
                                                         0.0011   0.0010     5.92
DIST              CAL(B)02     MOB7(01)              174.80374  -0.0010  -0.9969
                                                         0.0011   0.0010     5.92
DIST              CAL(B)02     GORF89                175.51212  -0.0001  -0.0704
                                                         0.0011   0.0010     0.42
DIST              CAL(B)02     GORF89                175.51222  -0.0002  -0.1668
                                                         0.0011   0.0010     0.99
DIST              CAL(B)02     SGEOS                 158.68995   0.0003   0.2912
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0040
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                        0.0011   0.0010     1.90
DIST              CAL(B)02     SGEOS                158.68955   0.0007   0.6778
                                                        0.0011   0.0010     4.42
DIST              CAL(B)02     MOB7(03)             174.80390  -0.0007  -0.6701
                                                        0.0011   0.0010     3.90
DIST              CAL(B)02     MOB7(03)             174.80420  -0.0010  -0.9652
                                                        0.0011   0.0010     5.61
DIST              CAL(B)02     NGEOS                165.71226   0.0002   0.2386
                                                        0.0011   0.0010     1.50
DIST              CAL(B)02     NGEOS                165.71326  -0.0008  -0.7186
                                                        0.0011   0.0010     4.53
DIST              CAL(B)02     SGEOS                158.68963   0.0006   0.6001
                                                        0.0011   0.0010     3.91
DIST              CAL(B)02     SGEOS                158.69023   0.0000   0.0201
                                                        0.0011   0.0010     0.13
DIST              CAL(B)02     7918ECC              190.12965  -0.0009  -0.8626
                                                        0.0011   0.0010     4.61
DIST              CAL(B)02     7918ECC              190.13025  -0.0015  -1.4533
                                                        0.0011   0.0010     7.76
DIST              CAL(B)02     CAL(A)01              99.15298   0.0004   0.4247
                                                        0.0010   0.0010     4.42
DIST              CAL(B)02     CAL(A)01              99.15358  -0.0002  -0.1564
                                                        0.0010   0.0010     1.63
DIST              CAL(B)02     CAL(D)98             202.01658  -0.0031  -2.9957
                                                        0.0011   0.0010    15.27
DIST              CAL(B)02     PIER(B)95            164.89461  -0.0006  -0.6100
                                                        0.0011   0.0010     3.86
DIST              CAL(B)02     PIER(B)95            164.89531  -0.0013  -1.2817
                                                        0.0011   0.0010     8.10
DIST              CAL(B)02     PIER(A)95            205.96100   0.0002   0.0631
                                                        0.0032   0.0032     0.98
DIST              CAL(B)02     PIER(A)95            205.96300  -0.0018  -0.5604
                                                        0.0032   0.0032     8.73
DIST              CAL(B)02     PIER(B)95            164.89600  -0.0020  -0.6345
                                                        0.0032   0.0032    12.30
DIST              CAL(B)02     PIER(C)95            216.36800  -0.0002  -0.0599
                                                        0.0032   0.0032     0.89
DIST              CAL(B)02     PIER(C)95            216.36700   0.0008   0.2509
                                                        0.0032   0.0032     3.73
DIST              CAL(B)02     CAL(C)01              28.89700  -0.0019  -0.5993
                                                        0.0032   0.0032    65.36
DIST              CAL(B)02     CAL(C)01              28.89800  -0.0029  -0.9166
                                                        0.0032   0.0032    99.97
DIST              CAL(B)02     CAL(C)01              28.89600  -0.0009  -0.2820
                                                        0.0032   0.0032    30.75
DIST              CAL(B)02     CAL(A)01              99.15151   0.0019   1.8502
                                                        0.0010   0.0010    19.27
DIST              CAL(B)02     CAL(A)01              99.15181   0.0016   1.5597
                                                        0.0010   0.0010    16.24
DIST              CAL(B)02     CAL(C)01              28.89467   0.0004   0.4369
                                                        0.0010   0.0010    15.23
DIST              CAL(B)02     CAL(C)01              28.89507   0.0000   0.0398
                                                        0.0010   0.0010     1.39
DIST              CAL(B)02     SLR00(03)            156.76132  -0.0003  -0.3587
                                                        0.0011   0.0010     2.21
DIST              CAL(D)98     DORIS PIER             6.26412   0.0010   1.0429
                                                        0.0010   0.0010   165.31
DIST              CAL(D)98     DORIS PIER             6.26492   0.0002   0.2373
                                                        0.0010   0.0010    37.62
DIST              DORIS PIER   CAL(A)01             154.66186  -0.0024  -2.3929
```

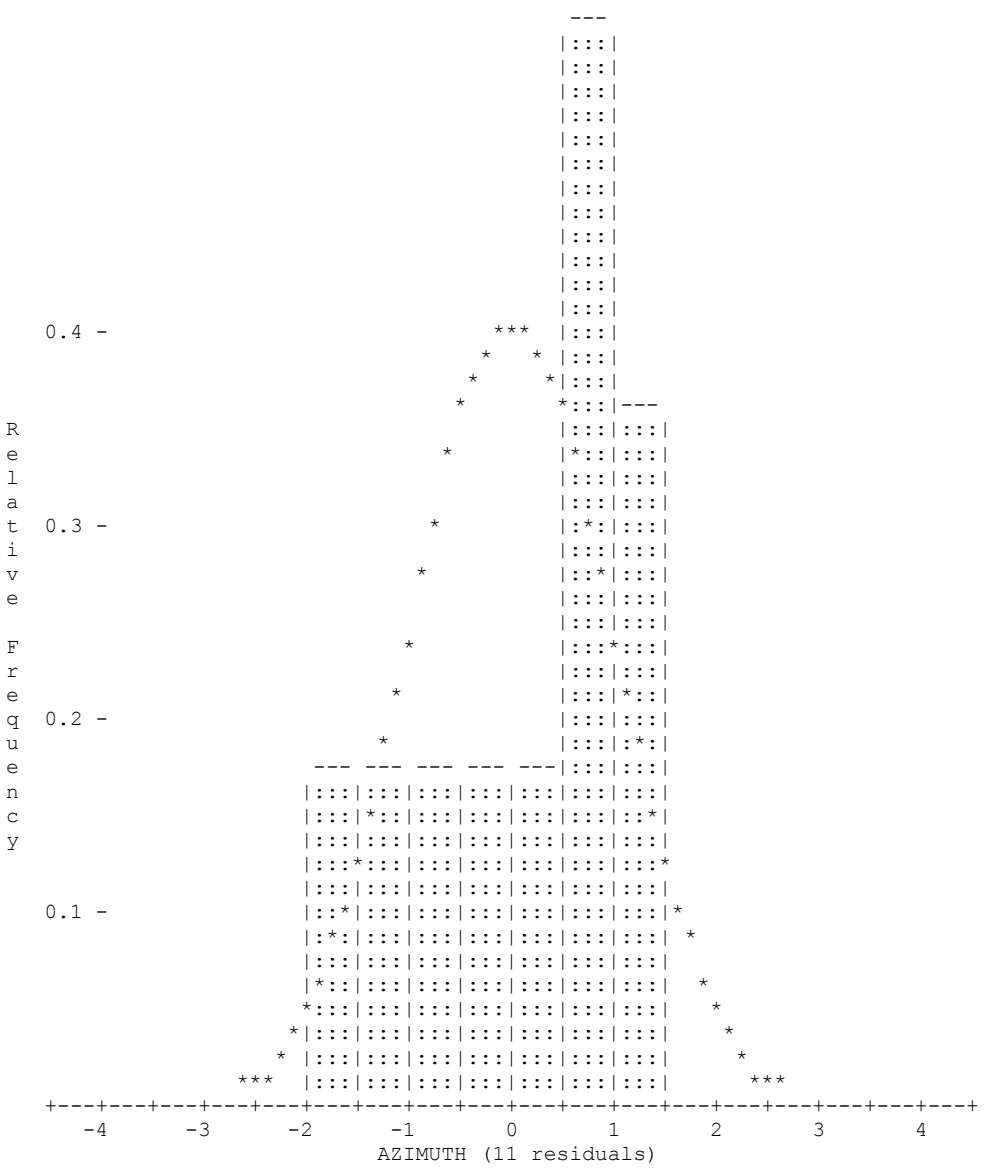
```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0041
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0011   0.0010    15.55
DIST              DORIS PIER   CAL(A)01              154.66046  -0.0010  -0.9997
                                                         0.0011   0.0010     6.50
DIST              DORIS PIER   CAL(A)01              154.66116  -0.0017  -1.6963
                                                         0.0011   0.0010    11.02
DIST              DORIS PIER   CAL(D)98                6.26445   0.0007   0.7109
                                                         0.0010   0.0010   112.69
DIST              DORIS PIER   CAL(D)98                6.26325   0.0019   1.9192
                                                         0.0010   0.0010   304.22
DIST              DORIS PIER   GORF89                 24.37794   0.0018   1.8002
                                                         0.0010   0.0010    73.81
DIST              DORIS PIER   SGEOS                  37.68262   0.0018   1.8351
                                                         0.0010   0.0010    48.52
DIST              DORIS PIER   GORF89                 24.37852   0.0012   1.2252
                                                         0.0010   0.0010    50.24
DIST              DORIS PIER   SGEOS                  37.68440   0.0000   0.0487
                                                         0.0010   0.0010     1.29
DIST              SGEOS        CAL(D)98               43.77576  -0.0006  -0.6130
                                                         0.0010   0.0010    14.16
DIST              SGEOS        CAL(D)98               43.77506   0.0001   0.0794
                                                         0.0010   0.0010     1.83
DIST              SGEOS        DORIS PIER             37.68449   0.0000  -0.0484
                                                         0.0010   0.0010     1.28
DIST              SGEOS        DORIS PIER             37.68289   0.0016   1.5574
                                                         0.0010   0.0010    41.18
DIST              SGEOS        GORF89                 18.47621   0.0003   0.2824
                                                         0.0010   0.0010    15.63
DIST              SGEOS        GORF89                 18.47681  -0.0003  -0.3043
                                                         0.0010   0.0010    16.84
DIST              GORF89       CAL(D)98               30.55920   0.0004   0.3501
                                                         0.0010   0.0010    11.58
DIST              GORF89       SGEOS                  18.47532   0.0012   1.1520
                                                         0.0010   0.0010    63.77
DIST              GORF89       SGEOS                  18.47622   0.0003   0.2720
                                                         0.0010   0.0010    15.06
DIST              GORF89       DORIS PIER             24.37843   0.0013   1.3174
                                                         0.0010   0.0010    54.02
DIST              GORF89       DORIS PIER             24.37883   0.0009   0.9173
                                                         0.0010   0.0010    37.61
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0042
================================================================================
```



```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0043
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: AZIMUTH
AZIM              NGEOS        PIER(A)95       32  2    46.80    -2.65    -1.44
                                                          2.00     1.85
AZIM              NGEOS        PIER(A)95       32  2    43.12     1.03     0.56
                                                          2.00     1.85
AZIM              NGEOS        PIER(A)95       32  2    47.37    -3.22    -1.74
                                                          2.00     1.85
AZIM              NGEOS        PIER(A)95       32  2    44.66    -0.51    -0.28
                                                          2.00     1.85
GAZI              CAL(B)02     PIER(A)95      340 15    44.12     1.75     0.61
                                                          3.00     2.90
GAZI              GORF89       PIER(B)95       16  4    17.50     4.19     1.46
                                                          3.00     2.87
GAZI              PIER(C)95    CAL(C)01       151 37    30.42     0.92     0.32
                                                          3.00     2.89
GAZI              PIER(C)95    CAL(B)02       146  0    15.81     2.03     0.70
                                                          3.00     2.89
GAZI              GODDARD      SGEOS          149  3    17.55     2.95     1.05
                                                          3.00     2.80
GAZI              GODDARD      PIER(B)95       47 33    50.84    -2.02    -0.73
                                                          3.00     2.75
GAZI              GORF89       NGEOS           12  3    45.14     2.21     0.77
                                                          3.00     2.85
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0044
================================================================================
```



```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0045
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO                        STD DEV  STD DEV      PPM
---- ----------- ------------ ------------ ----------------- -------- --------
GROUP: ZENITHAL ANGLE OBSERVATIONS
ZANG             PIER(A)95    MV3PED          83 43    22.57     1.18     0.00
                                                     6673.43  5449.42
ZANG             PIER(C)95    MV3PED          84 48    54.23     4.47     0.00
                                                     4153.64  3388.50
ZANG             7108RM1      MV3PED          83  4    34.20    -8.26     0.00
                                                     6564.62  5364.05
GROUP: DIRECTIONS
DIR              GODDARD      PIER(B)95        0  0     0.00    -1.71    -1.38
                                                        2.13     1.24
DIR              GODDARD      NGEOS           15  4    40.70     0.85     0.30
                                                        3.38     2.87
DIR              GODDARD      MOB7(03)        83 21    29.49     8.03     1.81
                                                        5.15     4.43
DIR              GODDARD      PIER(B)95        0  0     0.00    -0.76    -0.56
                                                        2.13     1.35
DIR              GODDARD      NGEOS           15  4    43.21    -0.71    -0.24
                                                        3.38     2.93
DIR              GODDARD      TLRS4(03)       22 40    35.41     2.49     0.96
                                                        3.30     2.59
DIR              GODDARD2     NGEOS            0  0     0.00    -5.02    -0.96
                                                        5.91     5.26
DIR              GODDARD2     TLRS4(03)        5 27    52.16    -6.15    -1.59
                                                        4.84     3.87
DIR              GODDARD2     7105            57 22    15.99    -0.36    -0.19
                                                        2.97     1.85
DIR              GODDARD2     MOB7(03)        57 24    27.51     3.91     1.92
                                                        2.96     2.03
DIR              GORF89       NGEOS            0  0     0.00    -0.42    -0.27
                                                        1.88     1.59
DIR              GORF89       CAL(B)02        69 23    27.40     0.11     0.20
                                                        1.09     0.57
DIR              GORF89       SGEOS           92 27    23.69    -0.64    -0.08
                                                        7.92     7.57
DIR              GORF89       CAL(D)98       217 12    15.78     0.84     0.19
                                                        4.82     4.37
DIR              GORF89       SGEOS            0  0     0.00     2.62     0.39
                                                        7.92     6.70
DIR              GORF89       CAL(D)98       124 44    56.89    -0.70    -0.25
                                                        4.82     2.83
DIR              GORF89       SLR00(03)      328 37    29.99    -0.65    -0.12
                                                        7.53     5.53
DIR              GORF89       NGEOS            0  0     0.00    -2.20    -1.31
                                                        1.88     1.68
DIR              GORF89       CAL(A)01        35 27    45.56    -0.55    -0.52
                                                        1.32     1.07
DIR              GORF89       CAL(B)02        69 23    24.72     1.02     1.33
                                                        1.09     0.76
DIR              GORF89       SGEOS           92 27    17.44     3.84     0.51
                                                        7.92     7.59
DIR              GORF89       CAL(D)98       217 12    14.46     0.38     0.09
                                                        4.82     4.39
DIR              NGEOS        PIER(B)95        0  0     0.00    -1.04    -0.23
                                                        4.61     4.46
DIR              NGEOS        CAL(B)01        72 47     7.80     0.31     0.47
                                                        1.00     0.66
DIR              NGEOS        CAL(C)01        92 52    18.50     0.18     0.22
                                                        1.11     0.81
DIR              NGEOS        MOB7(01)       178  5    26.82    -4.95    -1.52
                                                        3.48     3.26
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0046

Residuals (critical value = 4.225):

NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO			OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
DIR		NGEOS	CAL(B)01	0	0	0.00	-0.14	-0.22
						1.00	0.65	
DIR		NGEOS	CAL(C)01	20	5	10.68	-0.25	-0.31
						1.11	0.81	
DIR		NGEOS	MOB7(01)	105	18	9.46	4.16	1.28
						3.48	3.26	
DIR		NGEOS	PIER(A)95	0	0	0.00	-0.61	-0.71
						1.14	0.86	
DIR		NGEOS	4006E	1	36	4.40	-0.33	-0.24
						1.58	1.37	
DIR		NGEOS	CAL(C)01	87	24	22.36	0.75	0.93
						1.11	0.81	
DIR		NGEOS	PIER(C)95	0	0	0.00	-1.44	-1.22
						1.33	1.18	
DIR		NGEOS	4005W	7	42	57.11	2.01	1.19
						1.81	1.69	
DIR		NGEOS	PIER(B)95	10	43	24.65	0.26	0.06
						4.61	4.51	
DIR		NGEOS	PIER(A)95	16	11	20.54	0.37	0.39
						1.14	0.96	
DIR		NGEOS	4006E	17	47	23.81	1.78	1.23
						1.58	1.44	
DIR		NGEOS	CAL(B)02	93	43	45.80	-1.43	-1.55
						1.12	0.92	
DIR		NGEOS	GORF89	176	12	28.58	1.11	0.65
						1.88	1.71	
DIR		NGEOS	PIER(C)95	0	0	0.00	-0.44	-0.44
						1.33	1.00	
DIR		NGEOS	PIER(A)95	16	11	21.58	0.32	0.44
						1.14	0.73	
DIR		NGEOS	PIER(B)95	0	0	0.00	2.11	0.47
						4.61	4.47	
DIR		NGEOS	CAL(B)02	83	0	22.78	-1.20	-1.46
						1.12	0.82	
DIR		NGEOS	CAL(C)01	92	52	21.90	-0.06	-0.07
						1.11	0.81	
DIR		NGEOS	MOB7(03)	178	5	21.82	8.26	2.65
						3.48	3.12	
DIR		NGEOS	GODDARD	216	3	50.68	1.58	0.53
						3.38	2.98	
DIR		NGEOS	GODDARD2	271	20	47.55	2.77	0.53
						5.91	5.17	
DIR		NGEOS	CAL(B)02	0	0	0.00	-0.43	-0.78
						1.12	0.56	
DIR		NGEOS	GORF89	82	28	43.66	1.22	0.78
						1.88	1.56	
DIR		NGEOS	PIER(C)95	0	0	0.00	0.52	0.44
						1.33	1.16	
DIR		NGEOS	4005W	7	42	59.49	1.58	0.95
						1.81	1.67	
DIR		NGEOS	PIER(B)95	10	43	22.05	4.81	1.07
						4.61	4.50	
DIR		NGEOS	PIER(A)95	16	11	23.29	-0.43	-0.46
						1.14	0.93	
DIR		NGEOS	7108RM1	34	9	15.36	-1.92	-1.81
						1.25	1.06	
DIR		NGEOS	CAL(A)01	69	31	24.28	2.20	1.21
						1.98	1.82	
DIR		NGEOS	GODDARD	0	0	0.00	-0.69	-0.32
						3.38	2.17	

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0047
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
DIR               NGEOS        GODDARD2        55 16    56.89     0.47     0.10
                                                          5.91     4.82
DIR               NGEOS        PIER(B)95      143 56     9.50    -0.34    -0.09
                                                          4.61     3.72
DIR               NGEOS        TLRS4(03)      263 55    25.64    32.53     1.69
                                                         22.70    19.29
DIR               NGEOS        4005W            0  0     0.00    -0.14    -0.09
                                                          1.81     1.48
DIR               NGEOS        PIER(B)95        3  0    25.60     0.05     0.01
                                                          4.61     4.43
DIR               NGEOS        7108RM1         26 26    12.16     0.06     0.09
                                                          1.25     0.73
DIR               NGEOS        GODDARD          0  0     0.00    -0.58    -0.20
                                                          3.38     2.97
DIR               NGEOS        4005W          140 55    43.38     0.10     0.06
                                                          1.81     1.62
DIR               NGEOS        PIER(B)95      143 56    11.59    -2.32    -0.52
                                                          4.61     4.48
DIR               NGEOS        7108RM1        167 21    56.24    -0.39    -0.40
                                                          1.25     0.97
DIR               NGEOS        CAL(B)02       226 56    28.25     0.48     0.60
                                                          1.12     0.81
DIR               NGEOS        4005W            0  0     0.00     0.82     0.61
                                                          1.81     1.35
DIR               NGEOS        4006E           10  4    27.91    -0.62    -0.61
                                                          1.58     1.02
DIR               NGEOS        GORF89           0  0     0.00     0.21     0.14
                                                          1.88     1.46
DIR               NGEOS        7108(93)       205  9    57.43    -0.10    -0.14
                                                          1.28     0.68
DIR               NGEOS        GORF89           0  0     0.00     0.23     0.16
                                                          1.88     1.46
DIR               NGEOS        7108(93)       205  9    57.46    -0.11    -0.16
                                                          1.28     0.68
DIR               NGEOS        GORF89           0  0     0.00    -1.96    -1.34
                                                          1.88     1.46
DIR               NGEOS        7108(93)       205  9    54.26     0.91     1.34
                                                          1.28     0.68
DIR               SGEOS        GORF89           0  0     0.00    -1.38    -0.18
                                                          7.92     7.49
DIR               SGEOS        CAL(B)02       154 19    13.90     0.03     0.18
                                                          1.16     0.16
DIR               SGEOS        GORF89           0  0     0.00    -1.36    -0.18
                                                          7.92     7.52
DIR               SGEOS        CAL(B)02       154 19    13.90     0.06     0.16
                                                          1.16     0.36
DIR               SGEOS        CAL(D)98       325  2    14.64    -0.24    -0.08
                                                          3.40     2.92
DIR               SGEOS        CAL(D)98         0  0     0.00    -1.00    -0.71
                                                          3.40     1.41
DIR               SGEOS        GORF89          34 57    41.55     1.69     0.24
                                                          7.92     7.09
DIR               SGEOS        SLR00(03)      112 27    51.06    11.11     1.05
                                                         13.65    10.57
DIR               SGEOS        CAL(A)01         0  0     0.00    -1.13    -1.06
                                                          1.39     1.07
DIR               SGEOS        CAL(B)02        38 39    15.99     0.65     0.86
                                                          1.16     0.75
DIR               SGEOS        CAL(D)98       209 22    16.16     0.92     0.31
                                                          3.40     2.96
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0048
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO                        STD DEV  STD DEV      PPM
---- ----------- ------------ ------------ ----------------- -------- --------
DIR              SGEOS        GORF89         244 20      0.36     0.97     0.13
                                                        7.92     7.54
DIR              SGEOS        7105             0  0      0.00    -1.10    -0.55
                                                        2.95     1.98
DIR              SGEOS        GODDARD2         8  6      1.30     0.33     0.55
                                                        1.61     0.59
DIR              7105         GODDARD2         0  0      0.00    -1.70    -0.94
                                                        2.97     1.80
DIR              7105         NGEOS           29 20      4.31     2.35     0.94
                                                        3.49     2.49
DIR              7918ECC      GODDARD2         0  0      0.00     0.40     0.13
                                                        3.80     3.15
DIR              7918ECC      CAL(A)01        59  0     25.51     0.50     0.40
                                                        1.45     1.25
DIR              7918ECC      CAL(B)02        84 19      1.71     0.31     0.37
                                                        1.04     0.82
DIR              7918ECC      CAL(C)01        93  3     24.29    -0.46    -0.56
                                                        1.05     0.82
DIR              7918ECC      CAL(D)98       172  7     55.08    -0.54    -0.32
                                                        2.05     1.70
DIR              7108(93)     4006E            0  0      0.00     0.08     0.02
                                                        4.45     3.67
DIR              7108(93)     4005W           10 46     51.12    -0.03    -0.02
                                                        2.75     1.40
DIR              7108(93)     7108RM1          0  0      0.00     8.02     1.89
                                                        4.73     4.24
DIR              7108(93)     CAL(A)01        57 53     18.93     0.65     0.54
                                                        1.60     1.19
DIR              7108(93)     PIER(B)95       96 29     17.90    -0.02    -0.02
                                                        1.56     1.16
DIR              7108(93)     PIER(C)95      164 45     29.20    -5.55    -2.10
                                                        3.03     2.65
DIR              4005W        PIER(B)95        0  0      0.00    -1.30    -0.56
                                                        2.73     2.32
DIR              4005W        NGEOS            1 44     44.62    -0.47    -0.41
                                                        1.81     1.16
DIR              4005W        PIER(C)95      158 37     53.45     3.63     1.24
                                                        3.38     2.94
DIR              4005W        PIER(C)95        0  0      0.00     1.73     0.59
                                                        3.38     2.95
DIR              4005W        4006E           74 18     48.95    -6.99    -1.17
                                                        6.34     5.99
DIR              4005W        7108RM1         81 13      3.48    -0.33    -0.23
                                                        2.10     1.47
DIR              4005W        PIER(B)95      201 22      2.61     0.74     0.34
                                                        2.73     2.20
DIR              4005W        PIER(C)95        0  0      0.00     0.07     0.04
                                                        3.38     1.55
DIR              4005W        4006E           74 18     40.54    -0.24    -0.04
                                                        6.34     5.43
DIR              4005W        7108RM1          0  0      0.00    -1.57    -1.04
                                                        2.10     1.51
DIR              4005W        NGEOS          121 53     42.90     1.18     1.04
                                                        1.81     1.13
DIR              4005W        PIER(C)95        0  0      0.00     2.22     0.75
                                                        3.38     2.95
DIR              4005W        4006E           74 18     47.70    -5.24    -0.87
                                                        6.34     5.99
DIR              4005W        7108RM1         81 13      3.45     0.19     0.13
                                                        2.10     1.47
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                 GRS 80            UNITS: m,DMS          Page 0049
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
DIR               4005W        PIER(B)95      201 22     4.64    -0.80    -0.36
                                                          2.73     2.20
DIR               4005W        7108(93)         0  0     0.00    -0.33    -0.31
                                                          2.75     1.06
DIR               4005W        4006E           15 34     1.32     1.75     0.31
                                                          6.34     5.63
DIR               4006E        NGEOS            0  0     0.00     0.16     0.14
                                                          1.58     1.14
DIR               4006E        PIER(B)95        3  9    27.76    -0.63    -0.34
                                                          2.15     1.83
DIR               4006E        4005W           41  7    34.35    -7.49    -1.23
                                                          6.34     6.07
DIR               4006E        PIER(C)95      116 15    50.46     0.66     0.21
                                                          3.40     3.10
DIR               4006E        PIER(A)95      175 39     0.81     1.28     0.60
                                                          2.52     2.16
DIR               4006E        PIER(A)95        0  0     0.00    -0.30    -0.13
                                                          2.52     2.25
DIR               4006E        7108RM1         55 30    48.22     0.62     0.23
                                                          2.95     2.67
DIR               4006E        NGEOS          184 20    58.14    -0.38    -0.29
                                                          1.58     1.30
DIR               4006E        GODDARD        192 55    21.06     0.04     0.05
                                                          1.24     0.86
DIR               4006E        4005W          225 28    26.52    -2.05    -0.34
                                                          6.34     6.08
DIR               4006E        PIER(C)95      300 36    46.96     1.76     0.56
                                                          3.40     3.16
DIR               4006E        7108RM1          0  0     0.00     1.06     0.47
                                                          2.95     2.26
DIR               4006E        PIER(B)95      131 59    37.52    -0.56    -0.47
                                                          2.15     1.21
DIR               4006E        4005W            0  0     0.00    -1.80    -0.37
                                                          6.34     4.81
DIR               4006E        7108(93)       153 39     2.91     0.89     0.37
                                                          4.45     2.37
DIR               PIER(A)95    CAL(C)01         0  0     0.00    -0.59    -0.80
                                                          0.95     0.73
DIR               PIER(A)95    CAL(A)01        18 39    55.20     0.56     0.49
                                                          1.31     1.16
DIR               PIER(A)95    NGEOS           47 16    47.92     0.08     0.09
                                                          1.14     0.97
DIR               PIER(A)95    PIER(B)95       48 36    36.18     0.45     0.38
                                                          1.31     1.17
DIR               PIER(A)95    PIER(B)95        0  0     0.00     0.17     0.31
                                                          1.31     0.54
DIR               PIER(A)95    PIER(C)95       40 53    17.92    -0.79    -0.31
                                                          2.82     2.51
DIR               PIER(A)95    CAL(A)01         0  0     0.00     0.08     0.14
                                                          1.31     0.59
DIR               PIER(A)95    4006E           25 51    59.25    -0.31    -0.14
                                                          2.52     2.19
DIR               PIER(A)95    PIER(C)95        0  0     0.00     1.32     0.64
                                                          2.82     2.06
DIR               PIER(A)95    4006E          315  2     3.40    -1.06    -0.64
                                                          2.52     1.65
DIR               PIER(A)95    7108RM1          0  0     0.00     5.68     2.10
                                                          2.87     2.70
DIR               PIER(A)95    CAL(A)01        27 25    41.36    -0.20    -0.18
                                                          1.31     1.10
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0050
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                     STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
DIR               PIER(A)95    NGEOS          56  2    34.78    -1.38    -1.53
                                                        1.14     0.90
DIR               PIER(A)95    PIER(B)95      57 22    21.66     0.36     0.32
                                                        1.31     1.12
DIR               PIER(A)95    PIER(C)95      98 15    36.64     2.34     0.88
                                                        2.82     2.67
DIR               PIER(A)95    7108RM1         0  0     0.00    -2.85    -1.05
                                                        2.87     2.71
DIR               PIER(A)95    CAL(A)01       27 25    32.16     0.46     0.41
                                                        1.31     1.12
DIR               PIER(A)95    MV3PED         32 33    34.39   -18.00    -4.79
                                                        4.77     3.76
                                                      ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
DIR               PIER(A)95    4006E          53 17    29.90     1.58     0.66
                                                        2.52     2.38
DIR               PIER(A)95    NGEOS          56  2    24.58     0.28     0.31
                                                        1.14     0.92
DIR               PIER(A)95    PIER(B)95      57 22    12.79     0.70     0.61
                                                        1.31     1.13
DIR               PIER(A)95    PIER(C)95      98 15    30.48    -0.03    -0.01
                                                        2.82     2.68
DIR               PIER(B)95    CAL(B)01        0  0     0.00    -0.82    -1.18
                                                        1.02     0.70
DIR               PIER(B)95    CAL(A)01        0 49    55.39     1.48     0.71
                                                        2.25     2.09
DIR               PIER(B)95    CAL(C)01       21 49    48.78     0.48     0.59
                                                        1.10     0.81
DIR               PIER(B)95    NGEOS          98 19    12.85     2.10     0.47
                                                        4.61     4.47
DIR               PIER(B)95    CAL(C)01        0  0     0.00    -0.36    -0.72
                                                        1.10     0.50
DIR               PIER(B)95    MOB7(01)       75 23    55.64     1.28     0.72
                                                        2.07     1.77
DIR               PIER(B)95    PIER(A)95       0  0     0.00     0.02     0.02
                                                        1.31     1.01
DIR               PIER(B)95    4006E           3 25    43.28    -0.23    -0.12
                                                        2.15     1.94
DIR               PIER(B)95    CAL(B)01       74 52    59.58     0.04     0.07
                                                        1.02     0.61
DIR               PIER(B)95    PIER(C)95       0  0     0.00    -0.95    -0.69
                                                        1.65     1.38
DIR               PIER(B)95    4005W           9 28    24.78     4.73     1.87
                                                        2.73     2.54
DIR               PIER(B)95    PIER(A)95      21  1    25.95    -0.57    -0.60
                                                        1.31     0.96
DIR               PIER(B)95    4006E          24 27     8.18     0.22     0.12
                                                        2.15     1.93
DIR               PIER(B)95    CAL(A)01        0  0     0.00     0.95     0.47
                                                        2.25     2.03
DIR               PIER(B)95    CAL(B)02       11 36     8.58     0.15     0.22
                                                        1.13     0.67
DIR               PIER(B)95    MOB7(01)       96 23    52.35    -1.73    -0.96
                                                        2.07     1.80
DIR               PIER(B)95    NGEOS          97 29    16.91     2.12     0.48
                                                        4.61     4.45
DIR               PIER(B)95    PIER(C)95       0  0     0.00     0.49     0.34
                                                        1.65     1.42
DIR               PIER(B)95    4005W           9 28    28.88     2.07     0.81
                                                        2.73     2.56
DIR               PIER(B)95    PIER(A)95      21  1    26.15     0.66     0.65
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0051
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO                        STD DEV  STD DEV      PPM
---- ----------- ------------ ------------ ----------------- -------- --------
                                                        1.31     1.02
DIR              PIER(B)95    7108RM1         44 10    31.84    -1.83    -1.51
                                                        1.48     1.21
DIR              PIER(B)95    7108RM1          0  0     0.00    -0.86    -1.02
                                                        1.48     0.84
DIR              PIER(B)95    CAL(A)01        52 33    52.71     0.52     0.28
                                                        2.25     1.86
DIR              PIER(B)95    NGEOS          150  3     5.11     6.20     1.42
                                                        4.61     4.35
DIR              PIER(B)95    GODDARD          0  0     0.00    -0.81    -0.72
                                                        2.13     1.12
DIR              PIER(B)95    TLRS4(03)      330 34    30.85     2.90     0.87
                                                        4.16     3.35
DIR              PIER(B)95    NGEOS          339  0    52.09     0.22     0.05
                                                        4.61     4.17
DIR              PIER(B)95    CAL(A)01         0  0     0.00     0.56     0.32
                                                        2.25     1.75
DIR              PIER(B)95    SLR00(03)       78 16    10.52    -0.26    -0.32
                                                        1.55     0.82
DIR              PIER(B)95    PIER(C)95        0  0     0.00    -1.80    -1.27
                                                        1.65     1.41
DIR              PIER(B)95    PIER(A)95       21  1    23.35     1.18     1.16
                                                        1.31     1.02
DIR              PIER(B)95    7108(93)        28  7    53.15     0.06     0.05
                                                        1.56     1.24
DIR              PIER(B)95    CAL(A)01        96 44    20.94     0.88     0.43
                                                        2.25     2.04
DIR              PIER(B)95    NGEOS          194 13    44.60    -4.70    -1.06
                                                        4.61     4.43
DIR              PIER(B)95    4005W            0  0     0.00     0.07     0.03
                                                        2.73     2.38
DIR              PIER(B)95    7108RM1         34 41    59.22    -0.09    -0.11
                                                        1.48     0.77
DIR              PIER(B)95    NGEOS          184 45    10.66     0.65     0.15
                                                        4.61     4.32
DIR              PIER(B)95    4005W            0  0     0.00    -0.21    -0.10
                                                        2.73     2.11
DIR              PIER(B)95    4006E           14 58    38.54     0.13     0.10
                                                        2.15     1.31
DIR              PIER(B)95    NGEOS            0  0     0.00     4.64     1.10
                                                        4.61     4.22
DIR              PIER(B)95    7108(93)       193 54    18.48    -0.53    -1.10
                                                        1.56     0.49
DIR              PIER(C)95    PIER(A)95        0  0     0.00    -1.40    -0.54
                                                        2.82     2.57
DIR              PIER(C)95    4006E           75 38    48.84    -0.19    -0.06
                                                        3.40     3.19
DIR              PIER(C)95    4005W          106 11    42.30     1.86     0.58
                                                        3.38     3.19
DIR              PIER(C)95    PIER(B)95      118  5    14.54     0.78     0.57
                                                        1.65     1.37
DIR              PIER(C)95    NGEOS          121 35    31.12    -0.45    -0.47
                                                        1.33     0.97
DIR              PIER(C)95    PIER(A)95        0  0     0.00     0.36     0.17
                                                        2.82     2.07
DIR              PIER(C)95    4006E           75 38    48.38     2.03     0.73
                                                        3.40     2.80
DIR              PIER(C)95    4005W          106 11    48.45    -2.53    -0.91
                                                        3.38     2.78
DIR              PIER(C)95    PIER(A)95        0  0     0.00     0.11     0.05
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0052
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO                       STD DEV  STD DEV      PPM
---- ----------- ------------ ------------ ----------------- -------- --------
                                                        2.82     2.52
DIR              PIER(C)95    7108RM1        40 22    26.52     1.20     0.76
                                                        1.95     1.58
DIR              PIER(C)95    4005W         106 11    45.56     0.11     0.04
                                                        3.38     3.13
DIR              PIER(C)95    PIER(B)95     118  5    17.75    -0.92    -0.76
                                                        1.65     1.21
DIR              PIER(C)95    4005W           0  0     0.00    -2.73    -0.89
                                                        3.38     3.08
DIR              PIER(C)95    NGEOS          15 23    43.36     0.42     0.89
                                                        1.33     0.48
DIR              PIER(C)95    PIER(A)95       0  0     0.00     1.06     0.41
                                                        2.82     2.62
DIR              PIER(C)95    MV3PED         34 29    22.20    -6.77    -2.85
                                                        3.02     2.38
DIR              PIER(C)95    7108RM1        40 22    30.72    -2.05    -1.18
                                                        1.95     1.73
DIR              PIER(C)95    4006E          75 38    51.50    -0.38    -0.12
                                                        3.40     3.22
DIR              PIER(C)95    4005W         106 11    44.68     1.94     0.60
                                                        3.38     3.21
DIR              PIER(C)95    PIER(B)95     118  5    15.52     2.26     1.59
                                                        1.65     1.42
DIR              PIER(C)95    NGEOS         121 35    32.81     0.32     0.31
                                                        1.33     1.04
DIR              PIER(C)95    PIER(B)95       0  0     0.00     1.08     1.45
                                                        1.65     0.75
DIR              PIER(C)95    7108(93)      276 24     5.51    -3.66    -1.45
                                                        3.03     2.51
DIR              7108RM1      NGEOS           0  0     0.00    -1.65    -1.70
                                                        1.25     0.97
DIR              7108RM1      PIER(B)95       6 31     0.99    -1.39    -1.11
                                                        1.48     1.25
DIR              7108RM1      4005W          31 39    59.19     1.15     0.60
                                                        2.10     1.91
DIR              7108RM1      PIER(C)95      64 37    38.16     2.80     1.59
                                                        1.95     1.76
DIR              7108RM1      PIER(A)95     105 59    34.31     5.75     2.16
                                                        2.87     2.66
DIR              7108RM1      NGEOS           0  0     0.00    -0.24    -0.24
                                                        1.25     0.99
DIR              7108RM1      PIER(B)95       6 30    59.84     1.17     0.93
                                                        1.48     1.26
DIR              7108RM1      4005W          31 40     1.86    -0.11    -0.06
                                                        2.10     1.93
DIR              7108RM1      4006E          34 48     2.70     2.24     0.80
                                                        2.95     2.78
DIR              7108RM1      PIER(C)95      64 37    43.12    -0.75    -0.42
                                                        1.95     1.78
DIR              7108RM1      MV3PED         73 59    16.20    -1.73    -0.47
                                                        4.69     3.70
DIR              7108RM1      PIER(A)95     105 59    44.29    -2.82    -1.06
                                                        2.87     2.67
DIR              7108RM1      PIER(B)95       0  0     0.00    -0.59    -1.42
                                                        1.48     0.41
DIR              7108RM1      7108(93)       67 28     9.00     6.03     1.42
                                                        4.73     4.24
DIR              CAL(A)01     CAL(B)02        0  0     0.00    -0.34    -0.27
                                                        1.63     1.26
DIR              CAL(A)01     CAL(C)01       14  0    18.99    -0.30    -0.28
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0053

Residuals (critical value = 4.225):

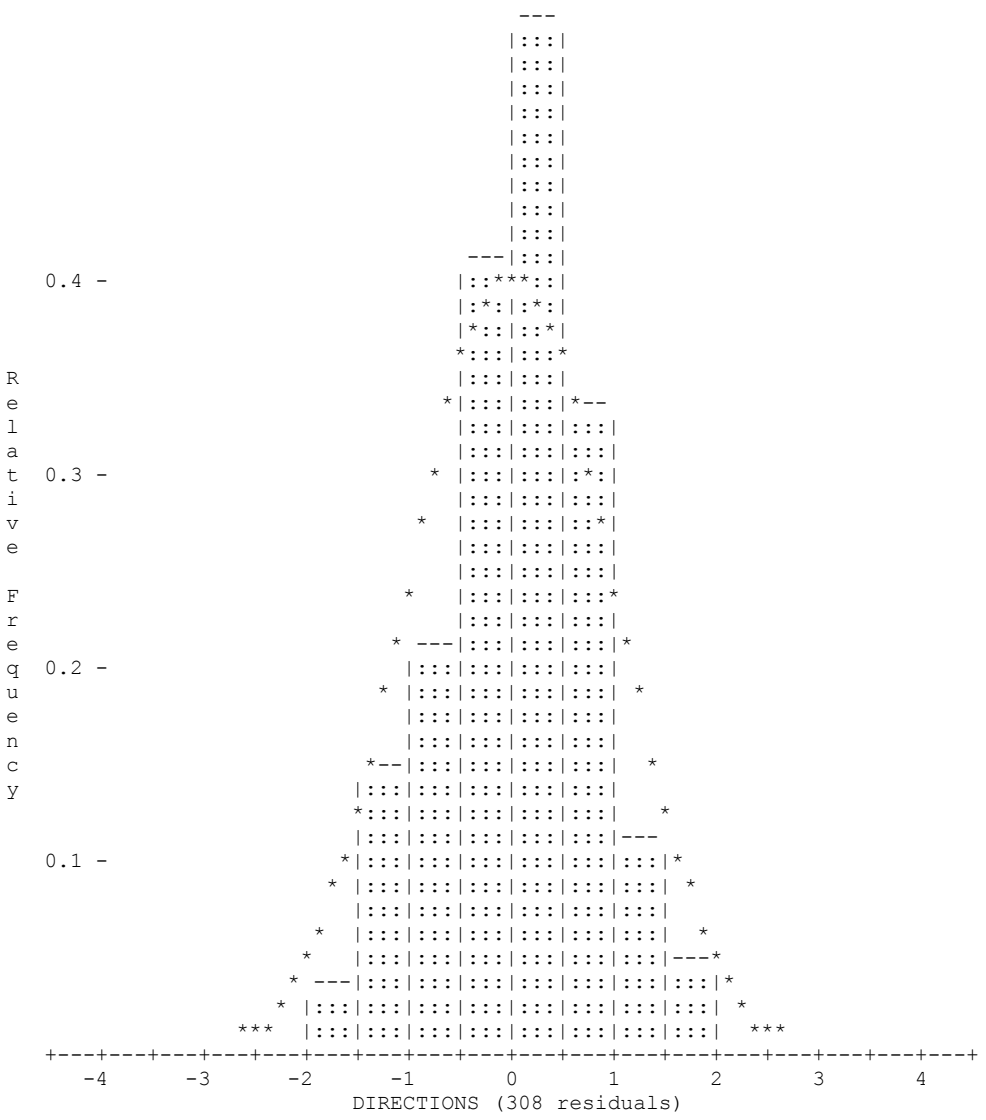
NOTE: Observation values shown are reduced to mark-to-mark.

TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
				1.48	1.07	
DIR		CAL(A)01	PIER(B)95 160 27	35.60	1.35	0.70
				2.25	1.94	
DIR		CAL(A)01	MOB7(03) 0 0	0.00	0.47	0.56
				1.54	0.84	
DIR		CAL(A)01	PIER(B)95 44 9	11.79	-1.02	-0.56
				2.25	1.80	
DIR		CAL(A)01	NGEOS 0 0	0.00	1.12	0.67
				1.98	1.67	
DIR		CAL(A)01	PIER(B)95 23 42	42.38	1.04	0.52
				2.25	1.99	
DIR		CAL(A)01	PIER(A)95 98 3	6.10	-0.84	-1.01
				1.31	0.83	
DIR		CAL(A)01	CAL(B)02 0 0	0.00	0.18	0.15
				1.63	1.21	
DIR		CAL(A)01	SLR00(03) 94 43	48.30	-0.23	-0.24
				1.46	0.99	
DIR		CAL(A)01	PIER(B)95 160 27	37.26	0.21	0.11
				2.25	1.94	
DIR		CAL(B)01	CAL(C)01 0 0	0.00	2.96	1.57
				2.08	1.89	
DIR		CAL(B)01	MOB7(01) 40 26	39.19	1.03	1.34
				0.96	0.77	
DIR		CAL(B)01	NGEOS 51 13	9.88	-0.05	-0.07
				1.00	0.82	
DIR		CAL(B)01	PIER(B)95 60 6	46.70	-1.80	-2.13
				1.02	0.84	
DIR		CAL(B)01	NGEOS 0 0	0.00	0.52	0.67
				1.00	0.77	
DIR		CAL(B)01	CAL(A)01 8 27	21.71	0.40	0.35
				1.32	1.14	
DIR		CAL(B)01	PIER(B)95 8 53	36.36	-0.77	-0.97
				1.02	0.79	
DIR		CAL(C)01	NGEOS 0 0	0.00	0.50	0.74
				1.11	0.68	
DIR		CAL(C)01	CAL(A)01 23 11	5.42	-0.99	-0.84
				1.48	1.17	
DIR		CAL(C)01	CAL(B)02 79 20	6.76	1.33	0.27
				5.10	4.87	
DIR		CAL(C)01	MOB7(01) 0 0	0.00	-0.64	-0.84
				1.11	0.77	
DIR		CAL(C)01	NGEOS 14 26	15.95	0.65	0.84
				1.11	0.78	
DIR		CAL(C)01	CAL(B)02 0 0	0.00	2.91	0.61
				5.10	4.76	
DIR		CAL(C)01	SLR00(03) 253 52	51.76	-0.17	-0.61
				1.22	0.27	
DIR		CAL(D)98	7918ECC 0 0	0.00	-1.14	-0.65
				2.05	1.74	
DIR		CAL(D)98	CAL(B)02 70 8	33.02	0.40	0.55
				1.01	0.72	
DIR		CAL(D)98	CAL(C)01 77 37	24.56	-0.13	-0.17
				1.04	0.77	
DIR		CAL(D)98	GORF89 0 0	0.00	0.85	0.20
				4.82	4.21	
DIR		CAL(D)98	SLR00(03) 9 8	22.34	-0.48	-0.23
				3.08	2.07	
DIR		CAL(D)98	SGEOS 20 17	22.88	0.16	0.06
				3.40	2.55	
DIR		MOB7(01)	NGEOS 0 0	0.00	3.70	1.15

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0054
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                  OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                     STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                        3.48     3.22
DIR               MOB7(01)     PIER(B)95       0 49    11.24     1.13     0.67
                                                        2.07     1.69
DIR               MOB7(01)     CAL(A)01       40 16    10.35    -1.34    -1.37
                                                        1.54     0.98
DIR               MOB7(01)     CAL(A)01        0  0     0.00     0.57     0.42
                                                        1.54     1.35
DIR               MOB7(01)     CAL(B)01       23 39    11.30     0.59     0.89
                                                        0.96     0.67
DIR               MOB7(01)     CAL(C)01       40  4    35.90    -1.08    -1.25
                                                        1.11     0.86
DIR               MOB7(01)     PIER(B)95       0  0     0.00     1.97     1.03
                                                        2.07     1.91
DIR               MOB7(01)     CAL(A)01       39 26    58.52     0.08     0.06
                                                        1.54     1.36
DIR               MOB7(01)     CAL(B)02       70  1    42.02    -1.02    -1.20
                                                        1.09     0.85
DIR               MOB7(01)     CAL(C)01       79 31    32.42     0.44     0.51
                                                        1.11     0.87
DIR               MOB7(03)     GODDARD         0  0     0.00    -3.88    -0.88
                                                        5.15     4.39
DIR               MOB7(03)     GODDARD2       44 24    34.35     0.29     0.13
                                                        2.96     2.17
DIR               MOB7(03)     NGEOS          73 44    39.22    -1.26    -0.44
                                                        3.48     2.85
DIR               MOB7(03)     TLRS4(03)      81  5    30.48     3.01     1.04
                                                        3.73     2.90
DIR               CAL(B)02     CAL(C)01        0  0     0.00     0.23     0.05
                                                        5.10     4.87
DIR               CAL(B)02     NGEOS          90 47    51.94     0.44     0.50
                                                        1.12     0.87
DIR               CAL(B)02     PIER(B)95     101 54    22.61     0.00     0.00
                                                        1.13     0.87
DIR               CAL(B)02     CAL(A)01      109 50    38.48    -0.94    -0.65
                                                        1.63     1.44
DIR               CAL(B)02     MOB7(01)        0  0     0.00    -0.96    -1.62
                                                        1.09     0.59
DIR               CAL(B)02     CAL(A)01       33  6    50.90     2.14     1.62
                                                        1.63     1.33
DIR               CAL(B)02     GORF89          0  0     0.00    -0.06    -0.07
                                                        1.09     0.88
DIR               CAL(B)02     CAL(D)98      355 23     0.21     0.14     0.18
                                                        1.01     0.77
DIR               CAL(B)02     SGEOS         357 23    10.91    -0.11    -0.12
                                                        1.16     0.95
DIR               CAL(B)02     CAL(C)01        0  0     0.00    -0.60    -0.12
                                                        5.10     4.86
DIR               CAL(B)02     SLR00(03)      63 40    29.79     1.54     1.95
                                                        1.16     0.79
DIR               CAL(B)02     PIER(B)95     101 54    23.20    -1.41    -1.91
                                                        1.13     0.74
DIR               CAL(B)02     CAL(D)98        0  0     0.00     0.08     0.09
                                                        1.01     0.82
DIR               CAL(B)02     SGEOS           2  0     9.80     0.73     0.73
                                                        1.16     0.99
DIR               CAL(B)02     7918ECC        22  2    32.92     0.08     0.09
                                                        1.04     0.83
DIR               CAL(B)02     NGEOS          32 44    47.30    -0.88    -0.92
                                                        1.12     0.95
DIR               CAL(B)02     CAL(D)98        0  0     0.00     0.13     0.19
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                 GRS 80            UNITS: m,DMS          Page 0055
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                         1.01     0.70
DIR               CAL(B)02     PIER(B)95       43 51    16.21     0.51     0.58
                                                         1.13     0.87
DIR               CAL(B)02     CAL(A)01        51 47    33.05    -1.41    -0.97
                                                         1.63     1.45
DIR               GORF89       CAL(A)01         0  0     0.00    -0.48    -1.13
                                                         1.32     0.43
DIR               GORF89       SGEOS           56 59    36.26    -0.47    -0.06
                                                         7.92     7.53
DIR               GORF89       DORIS PIER     179 43    43.42     2.14     0.47
                                                         5.89     4.60
DIR               GORF89       CAL(D)98       181 44    24.16     5.19     1.20
                                                         4.82     4.31
DIR               SGEOS        CAL(D)98         0  0     0.00     0.47     0.22
                                                         3.40     2.13
DIR               SGEOS        DORIS PIER       2  3    21.10    -1.68    -0.63
                                                         3.92     2.69
DIR               SGEOS        GORF89          34 57    40.38     4.34     0.59
                                                         7.92     7.31
DIR               DORIS PIER   GORF89           0  0     0.00    -1.31    -0.26
                                                         5.89     5.04
DIR               DORIS PIER   CAL(A)01         0 13    39.21     0.19     0.60
                                                         1.17     0.31
DIR               DORIS PIER   SGEOS           24 21    25.12    -1.50    -0.45
                                                         3.92     3.35
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0056
================================================================================
```



```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS           Page 0057
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
OHDF              GODDARD      GODDARD2          -0.75040  -0.0003  -0.3464
                                                    0.0010   0.0009     8.28
OHDF              GODDARD2     GODDARD            0.75070   0.0000   0.0000
                                                    0.0010   0.0009     0.00
OHDF              GODDARD      NGEOS              0.93670   0.0002   0.1941
                                                    0.0010   0.0009     3.97
OHDF              NGEOS        GODDARD           -0.93730   0.0004   0.4715
                                                    0.0010   0.0009     9.64
OHDF              GODDARD      NGEOS              0.93660   0.0003   0.3051
                                                    0.0010   0.0009     6.24
OHDF              NGEOS        GODDARD           -0.93660  -0.0003  -0.3051
                                                    0.0010   0.0009     6.24
OHDF              GODDARD2     NGEOS              1.68760   0.0000  -0.0277
                                                    0.0010   0.0009     1.01
OHDF              NGEOS        GODDARD2          -1.68790   0.0003   0.3606
                                                    0.0010   0.0009    13.08
OHDF              GODDARD2     NGEOS              1.68750   0.0001   0.0832
                                                    0.0010   0.0009     3.02
OHDF              NGEOS        GODDARD2          -1.68760   0.0000   0.0277
                                                    0.0010   0.0009     1.01
OHDF              GORF89       NGEOS              0.61760  -0.0001  -0.0908
                                                    0.0010   0.0009     1.02
OHDF              NGEOS        GORF89            -0.61760   0.0001   0.0908
                                                    0.0010   0.0009     1.02
OHDF              GORF89       NGEOS              0.61760  -0.0001  -0.0908
                                                    0.0010   0.0009     1.02
OHDF              NGEOS        GORF89            -0.61750   0.0000  -0.0160
                                                    0.0010   0.0009     0.18
OHDF              GORF89       SGEOS              0.51770   0.0001   0.0725
                                                    0.0010   0.0009     3.68
OHDF              SGEOS        GORF89            -0.51780   0.0000   0.0342
                                                    0.0010   0.0009     1.74
OHDF              GORF89       SGEOS              0.51760   0.0002   0.1792
                                                    0.0010   0.0009     9.09
OHDF              SGEOS        GORF89            -0.51730  -0.0005  -0.4993
                                                    0.0010   0.0009    25.33
OHDF              GORF89       CAL(D)98           1.53500  -0.0002  -0.1803
                                                    0.0010   0.0009     5.43
OHDF              CAL(D)98     GORF89            -1.53510   0.0003   0.2890
                                                    0.0010   0.0009     8.70
OHDF              NGEOS        SGEOS             -0.09970   0.0000  -0.0490
                                                    0.0010   0.0010     0.55
OHDF              SGEOS        NGEOS              0.10000  -0.0003  -0.2634
                                                    0.0010   0.0010     2.93
OHDF              NGEOS        SGEOS             -0.10020   0.0005   0.4717
                                                    0.0010   0.0010     5.25
OHDF              SGEOS        NGEOS              0.09990  -0.0002  -0.1593
                                                    0.0010   0.0010     1.77
OHDF              NGEOS        7105               0.22470   0.0016   1.6282
                                                    0.0010   0.0010    36.92
OHDF              7105         NGEOS             -0.22530  -0.0010  -1.0074
                                                    0.0010   0.0010    22.84
OHDF              NGEOS        7105               0.22670  -0.0004  -0.4412
                                                    0.0010   0.0010    10.00
OHDF              7105         NGEOS             -0.22700   0.0007   0.7516
                                                    0.0010   0.0010    17.04
OHDF              NGEOS        7105               0.22770  -0.0014  -1.4759
                                                    0.0010   0.0010    33.47
OHDF              7105         NGEOS             -0.22700   0.0007   0.7516
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0058
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0010    17.04
OHDF              NGEOS        7105                     0.22490   0.0014   1.4213
                                                         0.0010   0.0010    32.23
OHDF              7105         NGEOS                   -0.22640   0.0001   0.1308
                                                         0.0010   0.0010     2.97
OHDF              NGEOS        7105                     0.22670  -0.0004  -0.4412
                                                         0.0010   0.0010    10.00
OHDF              7105         NGEOS                   -0.22770   0.0014   1.4759
                                                         0.0010   0.0010    33.47
OHDF              NGEOS        7105                     0.22590   0.0004   0.3866
                                                         0.0010   0.0010     8.77
OHDF              7105         NGEOS                   -0.22580  -0.0005  -0.4901
                                                         0.0010   0.0010    11.11
OHDF              NGEOS        PIER(A)95               -5.20340   0.0011   1.1615
                                                         0.0010   0.0009     6.69
OHDF              PIER(A)95    NGEOS                    5.20220   0.0001   0.1149
                                                         0.0010   0.0009     0.66
OHDF              NGEOS        PIER(B)95               -1.21530   0.0008   0.8510
                                                         0.0010   0.0010    25.51
OHDF              PIER(B)95    NGEOS                    1.21430   0.0002   0.1903
                                                         0.0010   0.0010     5.71
OHDF              NGEOS        PIER(B)95               -1.21390  -0.0006  -0.6069
                                                         0.0010   0.0010    18.19
OHDF              PIER(B)95    NGEOS                    1.21410   0.0004   0.3986
                                                         0.0010   0.0010    11.95
OHDF              NGEOS        PIER(B)95               -1.21450   0.0000   0.0179
                                                         0.0010   0.0010     0.54
OHDF              PIER(B)95    NGEOS                    1.21440   0.0001   0.0862
                                                         0.0010   0.0010     2.58
OHDF              NGEOS        PIER(B)95               -1.21450   0.0000   0.0179
                                                         0.0010   0.0010     0.54
OHDF              PIER(B)95    NGEOS                    1.21500  -0.0005  -0.5386
                                                         0.0010   0.0010    16.15
OHDF              NGEOS        CAL(A)01                -2.53640   0.0002   0.1857
                                                         0.0010   0.0010     2.29
OHDF              CAL(A)01     NGEOS                    2.53640  -0.0002  -0.1857
                                                         0.0010   0.0010     2.29
OHDF              NGEOS        CAL(A)01                -2.53700   0.0008   0.8016
                                                         0.0010   0.0010     9.89
OHDF              CAL(A)01     NGEOS                    2.53710  -0.0009  -0.9043
                                                         0.0010   0.0010    11.16
OHDF              NGEOS        CAL(A)01                -2.53680   0.0006   0.5963
                                                         0.0010   0.0010     7.36
OHDF              CAL(A)01     NGEOS                    2.53570   0.0005   0.5328
                                                         0.0010   0.0010     6.57
OHDF              NGEOS        CAL(A)01                -2.53630   0.0001   0.0831
                                                         0.0010   0.0010     1.02
OHDF              CAL(A)01     NGEOS                    2.53630  -0.0001  -0.0831
                                                         0.0010   0.0010     1.02
OHDF              NGEOS        CAL(B)01                -2.80760   0.0018   1.8628
                                                         0.0010   0.0009     8.56
OHDF              CAL(B)01     NGEOS                    2.80560   0.0002   0.2612
                                                         0.0010   0.0009     1.20
OHDF              NGEOS        CAL(B)01                -2.80600   0.0002   0.1636
                                                         0.0010   0.0009     0.75
OHDF              CAL(B)01     NGEOS                    2.80550   0.0003   0.3675
                                                         0.0010   0.0009     1.69
OHDF              NGEOS        CAL(C)01                -1.64950   0.0011   1.1301
                                                         0.0010   0.0010     6.44
OHDF              CAL(C)01     NGEOS                    1.64750   0.0009   0.9502
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0059
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                        0.0010   0.0010     5.42
OHDF              NGEOS        CAL(C)01              -1.64820  -0.0002  -0.2221
                                                        0.0010   0.0010     1.27
OHDF              CAL(C)01     NGEOS                  1.64810   0.0003   0.3261
                                                        0.0010   0.0010     1.86
OHDF              NGEOS        MOB7(01)               3.36410   0.0004   0.5941
                                                        0.0010   0.0007    10.35
OHDF              MOB7(01)     NGEOS                 -3.36480   0.0003   0.3457
                                                        0.0010   0.0007     6.02
OHDF              SGEOS        7105                   0.32630  -0.0003  -0.2984
                                                        0.0010   0.0009     5.49
OHDF              7105         SGEOS                 -0.32600   0.0000  -0.0221
                                                        0.0010   0.0009     0.41
OHDF              4005W        4006E                  0.27010  -0.0003  -0.3094
                                                        0.0010   0.0010    12.87
OHDF              4006E        4005W                 -0.27000   0.0002   0.2055
                                                        0.0010   0.0010     8.55
OHDF              4005W        4006E                  0.26860   0.0012   1.2480
                                                        0.0010   0.0010    51.92
OHDF              4006E        4005W                 -0.26860  -0.0012  -1.2480
                                                        0.0010   0.0010    51.92
OHDF              4005W        PIER(A)95             -0.47490   0.0001   0.1107
                                                        0.0010   0.0010     1.36
OHDF              PIER(A)95    4005W                  0.47430   0.0005   0.5131
                                                        0.0010   0.0010     6.32
OHDF              4005W        PIER(A)95             -0.47460  -0.0002  -0.2012
                                                        0.0010   0.0010     2.48
OHDF              PIER(A)95    4005W                  0.47450   0.0003   0.3052
                                                        0.0010   0.0010     3.76
OHDF              4005W        PIER(B)95              3.51270   0.0003   0.3506
                                                        0.0010   0.0009     6.01
OHDF              PIER(B)95    4005W                 -3.51350   0.0005   0.4948
                                                        0.0010   0.0009     8.48
OHDF              4005W        PIER(B)95              3.51290   0.0001   0.1392
                                                        0.0010   0.0009     2.39
OHDF              PIER(B)95    4005W                 -3.51280  -0.0002  -0.2449
                                                        0.0010   0.0009     4.20
OHDF              4005W        PIER(C)95             -1.58440   0.0004   0.4151
                                                        0.0010   0.0010     9.09
OHDF              PIER(C)95    4005W                  1.58470  -0.0007  -0.7262
                                                        0.0010   0.0010    15.90
OHDF              4005W        PIER(C)95             -1.58400   0.0000   0.0004
                                                        0.0010   0.0010     0.01
OHDF              PIER(C)95    4005W                  1.58390   0.0001   0.1032
                                                        0.0010   0.0010     2.26
OHDF              4005W        7108RM1               -0.88200   0.0002   0.2466
                                                        0.0010   0.0010     3.19
OHDF              7108RM1      4005W                  0.88200  -0.0002  -0.2466
                                                        0.0010   0.0010     3.19
OHDF              4005W        CAL(A)01               2.19170  -0.0004  -0.4299
                                                        0.0010   0.0009     4.73
OHDF              CAL(A)01     4005W                 -2.19160   0.0003   0.3236
                                                        0.0010   0.0009     3.56
OHDF              4006E        PIER(A)95             -0.74360  -0.0010  -1.0355
                                                        0.0010   0.0010    16.56
OHDF              PIER(A)95    4006E                  0.74340   0.0012   1.2435
                                                        0.0010   0.0010    19.89
OHDF              4006E        PIER(A)95             -0.74530   0.0007   0.7327
                                                        0.0010   0.0010    11.72
OHDF              PIER(A)95    4006E                  0.74570  -0.0011  -1.1488
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0060

Residuals (critical value = 4.225):

NOTE: Observation values shown are reduced to mark-to-mark.

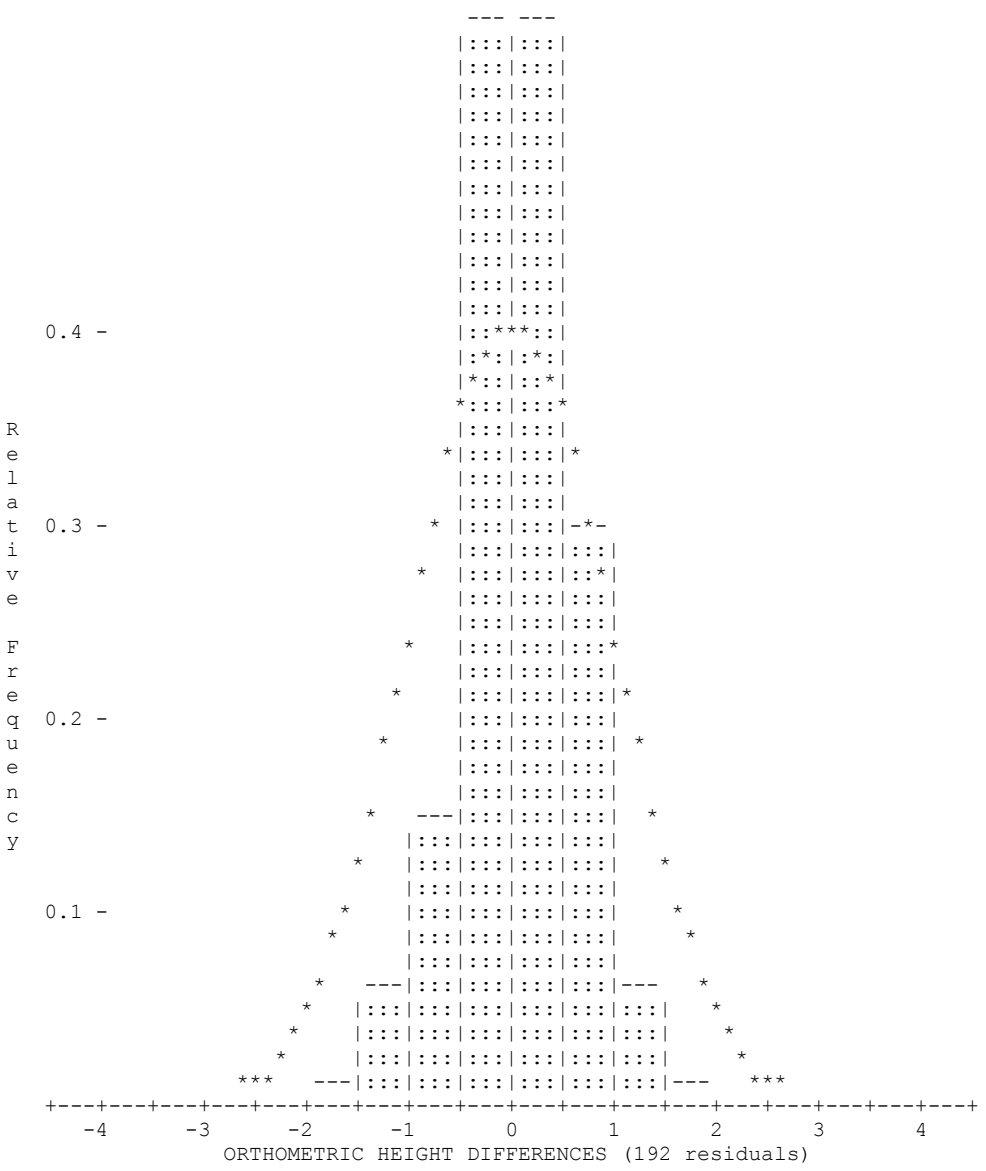
TYPE	AT	FROM	TO	OBSERVATION STD DEV	RESIDUAL STD DEV	STD RES PPM
				0.0010	0.0010	18.37
OHDF		4006E	PIER(A)95	-0.74550	0.0009	0.9407
				0.0010	0.0010	15.04
OHDF		PIER(A)95	4006E	0.74520	-0.0006	-0.6287
				0.0010	0.0010	10.05
OHDF		4006E	PIER(C)95	-1.85460	0.0008	0.8332
				0.0010	0.0010	18.19
OHDF		PIER(C)95	4006E	1.85410	-0.0003	-0.3114
				0.0010	0.0010	6.80
OHDF		4006E	PIER(C)95	-1.85300	-0.0008	-0.8365
				0.0010	0.0010	18.26
OHDF		PIER(C)95	4006E	1.85310	0.0007	0.7321
				0.0010	0.0010	15.98
OHDF		PIER(A)95	PIER(C)95	-1.10950	0.0003	0.3052
				0.0010	0.0010	5.50
OHDF		PIER(C)95	PIER(A)95	1.10870	0.0005	0.5254
				0.0010	0.0010	9.47
OHDF		PIER(A)95	PIER(C)95	-1.10980	0.0006	0.6166
				0.0010	0.0010	11.12
OHDF		PIER(C)95	PIER(A)95	1.10980	-0.0006	-0.6166
				0.0010	0.0010	11.12
OHDF		PIER(A)95	7108RM1	-0.40740	0.0004	0.4524
				0.0010	0.0009	8.19
OHDF		7108RM1	PIER(A)95	0.40730	-0.0003	-0.3469
				0.0010	0.0009	6.28
OHDF		PIER(B)95	PIER(C)95	-5.09790	0.0009	0.9292
				0.0010	0.0009	8.90
OHDF		PIER(C)95	PIER(B)95	5.09740	-0.0004	-0.3944
				0.0010	0.0009	3.78
OHDF		PIER(B)95	CAL(A)01	-1.32090	-0.0008	-0.8829
				0.0010	0.0009	12.28
OHDF		CAL(A)01	PIER(B)95	1.32170	0.0000	0.0383
				0.0010	0.0009	0.53
OHDF		PIER(C)95	7108RM1	0.70150	0.0007	0.7753
				0.0010	0.0009	9.19
OHDF		7108RM1	PIER(C)95	-0.70120	-0.0010	-1.0918
				0.0010	0.0009	12.94
OHDF		7108RM1	CAL(A)01	3.07290	0.0002	0.1715
				0.0010	0.0009	1.80
OHDF		CAL(A)01	7108RM1	-3.07270	-0.0004	-0.3857
				0.0010	0.0009	4.04
OHDF		CAL(A)01	CAL(B)01	-0.27120	0.0016	1.6744
				0.0010	0.0009	12.13
OHDF		CAL(B)01	CAL(A)01	0.26920	0.0004	0.4544
				0.0010	0.0009	3.29
OHDF		CAL(B)01	CAL(C)01	1.15670	0.0007	0.7759
				0.0010	0.0009	9.86
OHDF		CAL(A)01	CAL(C)01	0.88690	0.0009	0.9360
				0.0010	0.0010	8.06
OHDF		CAL(C)01	CAL(A)01	-0.88890	0.0011	1.1312
				0.0010	0.0010	9.75
OHDF		CAL(A)01	CAL(C)01	0.88800	-0.0002	-0.2010
				0.0010	0.0010	1.73
OHDF		CAL(C)01	CAL(A)01	-0.88800	0.0002	0.2010
				0.0010	0.0010	1.73
OHDF		CAL(A)01	CAL(C)01	0.88810	-0.0003	-0.3044
				0.0010	0.0010	2.62
OHDF		CAL(C)01	CAL(A)01	-0.88820	0.0004	0.4077
				0.0010	0.0010	3.51
OHDF		CAL(A)01	CAL(B)02	0.54010	0.0005	0.5433

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0061
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0009     5.19
OHDF              CAL(B)02     CAL(A)01              -0.54040  -0.0002  -0.2264
                                                         0.0010   0.0009     2.16
OHDF              CAL(C)01     CAL(B)01              -1.15720  -0.0002  -0.2462
                                                         0.0010   0.0009     3.13
OHDF              CAL(C)01     CAL(B)01              -1.15810   0.0007   0.7072
                                                         0.0010   0.0009     8.99
OHDF              CAL(C)01     CAL(B)01              -1.15590  -0.0015  -1.6234
                                                         0.0010   0.0009    20.63
OHDF              CAL(B)01     CAL(C)01               1.15680   0.0006   0.6700
                                                         0.0010   0.0009     8.51
OHDF              CAL(C)01     CAL(B)02              -0.34780   0.0006   0.6408
                                                         0.0010   0.0010    21.07
OHDF              CAL(B)02     CAL(C)01               0.34800  -0.0008  -0.8513
                                                         0.0010   0.0010    27.99
OHDF              CAL(C)01     CAL(B)02              -0.34680  -0.0004  -0.4118
                                                         0.0010   0.0010    13.54
OHDF              CAL(B)02     CAL(C)01               0.34780  -0.0006  -0.6408
                                                         0.0010   0.0010    21.07
OHDF              NGEOS        CAL(A)01              -2.53610  -0.0001  -0.1222
                                                         0.0010   0.0010     1.51
OHDF              CAL(A)01     NGEOS                  2.53530   0.0009   0.9435
                                                         0.0010   0.0010    11.64
OHDF              CAL(A)01     CAL(B)02               0.54070  -0.0001  -0.0906
                                                         0.0010   0.0009     0.86
OHDF              CAL(B)02     CAL(A)01              -0.54060   0.0000  -0.0151
                                                         0.0010   0.0009     0.14
OHDF              NGEOS        CAL(B)02              -1.99540  -0.0002  -0.2181
                                                         0.0010   0.0009     1.24
OHDF              CAL(B)02     NGEOS                  1.99470   0.0009   0.9636
                                                         0.0010   0.0009     5.46
OHDF              CAL(A)01     CAL(C)01               0.88790  -0.0001  -0.0976
                                                         0.0010   0.0010     0.84
OHDF              CAL(C)01     CAL(A)01              -0.88810   0.0003   0.3044
                                                         0.0010   0.0010     2.62
OHDF              CAL(B)02     CAL(C)01               0.34650   0.0007   0.7276
                                                         0.0010   0.0010    23.92
OHDF              CAL(C)01     CAL(B)02              -0.34670  -0.0005  -0.5171
                                                         0.0010   0.0010    17.00
OHDF              NGEOS        TLRS4(03)              2.31210  -0.0003  -0.3536
                                                         0.0010   0.0007    38.90
OHDF              TLRS4(03)    NGEOS                 -2.31160  -0.0003  -0.3536
                                                         0.0010   0.0007    38.90
OHDF              NGEOS        MOB7(03)               3.36460   0.0005   0.5591
                                                         0.0010   0.0009    11.58
OHDF              MOB7(03)     NGEOS                 -3.36500  -0.0001  -0.1074
                                                         0.0010   0.0009     2.22
OHDF              7105         MOB7(91)               3.15080  -0.0014  -1.9384
                                                         0.0010   0.0007   458.73
OHDF              MOB7(91)     7105                  -3.14800  -0.0014  -1.8182
                                                         0.0010   0.0007   430.29
OHDF              7105         MOB7(03)               3.13890  -0.0001  -0.0877
                                                         0.0010   0.0009    24.99
OHDF              MOB7(03)     7105                  -3.13910   0.0003   0.3113
                                                         0.0010   0.0009    88.71
OHDF              CAL(D)98     SGEOS                 -1.01760   0.0005   0.5617
                                                         0.0010   0.0010    12.19
OHDF              SGEOS        CAL(D)98               1.01820  -0.0011  -1.1932
                                                         0.0010   0.0010    25.90
OHDF              SLR00(03)    CAL(D)98              -2.31620   0.0002   0.2736
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0062
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ------------------ -------- --------
                                                         0.0010   0.0009     4.79
OHDF              CAL(D)98     SLR00(03)             2.31800  -0.0020  -2.3866
                                                         0.0010   0.0009    41.82
OHDF              SGEOS        SLR00(03)             3.33320  -0.0002  -0.1959
                                                         0.0010   0.0009    15.60
OHDF              SLR00(03)    SGEOS                -3.33060  -0.0024  -2.8561
                                                         0.0010   0.0009   227.49
OHDF              NGEOS        SGEOS                -0.09940  -0.0003  -0.3614
                                                         0.0010   0.0010     4.02
OHDF              SGEOS        NGEOS                 0.09970   0.0000   0.0490
                                                         0.0010   0.0010     0.55
OHDF              NGEOS        CAL(D)98              0.91780  -0.0005  -0.5094
                                                         0.0010   0.0009     4.40
OHDF              CAL(D)98     NGEOS                -0.91740   0.0001   0.0857
                                                         0.0010   0.0009     0.74
OHDF              NGEOS        7918ECC              -0.26290  -0.0001  -0.1414
                                                         0.0010   0.0007     2.43
OHDF              7918ECC      NGEOS                 0.26310  -0.0001  -0.1414
                                                         0.0010   0.0007     2.43
OHDF              7108RM1      4005W                 0.88190  -0.0001  -0.1418
                                                         0.0010   0.0010     1.83
OHDF              4005W        7108RM1              -0.88160  -0.0002  -0.1725
                                                         0.0010   0.0010     2.23
OHDF              NGEOS        7108RM1              -5.60890  -0.0004  -0.4032
                                                         0.0010   0.0009     2.69
OHDF              7108RM1      NGEOS                 5.60860   0.0007   0.7222
                                                         0.0010   0.0009     4.82
OHDF              PIER(C)95    PIER(A)95             1.10940  -0.0002  -0.2014
                                                         0.0010   0.0010     3.63
OHDF              PIER(A)95    PIER(C)95            -1.10890  -0.0003  -0.3178
                                                         0.0010   0.0010     5.73
OHDF              PIER(C)95    4005W                 1.58320   0.0008   0.8290
                                                         0.0010   0.0010    18.15
OHDF              4005W        PIER(C)95            -1.58350  -0.0005  -0.5179
                                                         0.0010   0.0010    11.34
OHDF              NGEOS        4006E                -4.45690  -0.0008  -0.8649
                                                         0.0010   0.0009     7.87
OHDF              4006E        NGEOS                 4.45740   0.0003   0.3327
                                                         0.0010   0.0009     3.03
OHDF              7108RM1      4006E                 1.15130   0.0003   0.2820
                                                         0.0010   0.0009     5.24
OHDF              4006E        7108RM1              -1.15120  -0.0004  -0.3877
                                                         0.0010   0.0009     7.20
OHDF              4006E        4005W                -0.27000   0.0002   0.2055
                                                         0.0010   0.0010     8.55
OHDF              4005W        4006E                 0.27030  -0.0005  -0.5170
                                                         0.0010   0.0010    21.51
OHDF              7108(93)     7108RM1              -0.38810  -0.0003  -0.3684
                                                         0.0010   0.0009    10.54
OHDF              7108RM1      7108(93)              0.38800   0.0004   0.4804
                                                         0.0010   0.0009    13.75
OHDF              7108(93)     PIER(A)95             0.01840   0.0001   0.1586
                                                         0.0010   0.0009     4.63
OHDF              PIER(A)95    7108(93)             -0.01830  -0.0002  -0.2700
                                                         0.0010   0.0009     7.89
OHDF              7108(93)     PIER(C)95            -1.09110   0.0004   0.4860
                                                         0.0010   0.0009     8.82
OHDF              PIER(C)95    7108(93)              1.09060   0.0001   0.0709
                                                         0.0010   0.0009     1.29
OHDF              7105         MOB7(92)              3.13830   0.0000   0.0056
```

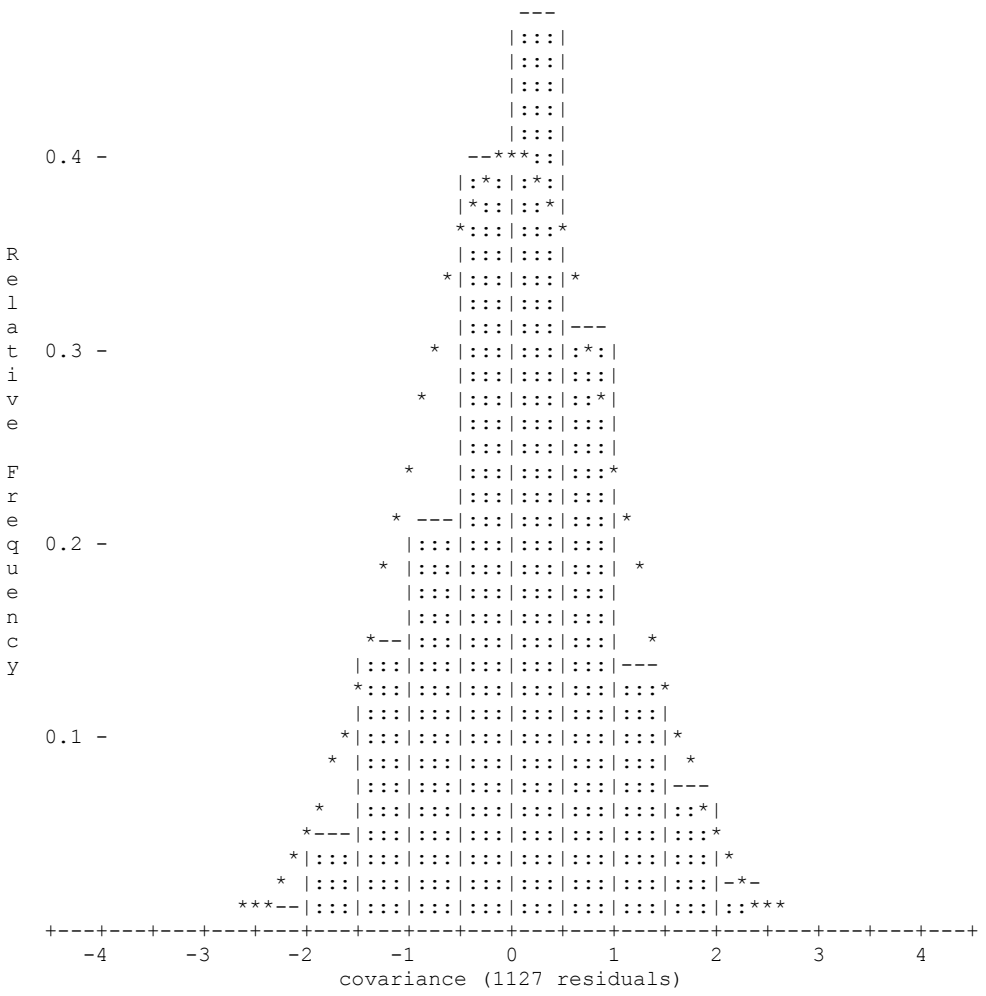
```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0063
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                        0.0010   0.0004     0.80
OHDF              7105         MOB7(03)                3.13900  -0.0002  -0.1995
                                                        0.0010   0.0009    56.85
OHDF              CAL(D)98     DORIS PIER              0.03080  -0.0001  -0.1242
                                                        0.0010   0.0009    17.88
OHDF              DORIS PIER   CAL(D)98               -0.03080   0.0001   0.1242
                                                        0.0010   0.0009    17.88
OHDF              CAL(D)98     NGEOS                  -0.91760   0.0003   0.2975
                                                        0.0010   0.0009     2.57
OHDF              NGEOS        CAL(D)98                0.91740  -0.0001  -0.0857
                                                        0.0010   0.0009     0.74
OHDF              NGEOS        DORIS PIER              0.94800   0.0000   0.0080
                                                        0.0010   0.0009     0.07
OHDF              SGEOS        DORIS PIER              1.04750   0.0003   0.2766
                                                        0.0010   0.0009     6.75
OHDF              DORIS PIER   SGEOS                  -1.04800   0.0002   0.2674
                                                        0.0010   0.0009     6.52
OHDF              SGEOS        DORIS PIER              1.04800  -0.0002  -0.2674
                                                        0.0010   0.0009     6.52
OHDF              DORIS PIER   SGEOS                  -1.04730  -0.0005  -0.4941
                                                        0.0010   0.0009    12.05
OHDF              CAL(D)98     SGEOS                  -1.01600  -0.0011  -1.1221
                                                        0.0010   0.0010    24.36
OHDF              SGEOS        CAL(D)98                1.01760  -0.0005  -0.5617
                                                        0.0010   0.0010    12.19
```

```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0064
================================================================================
```

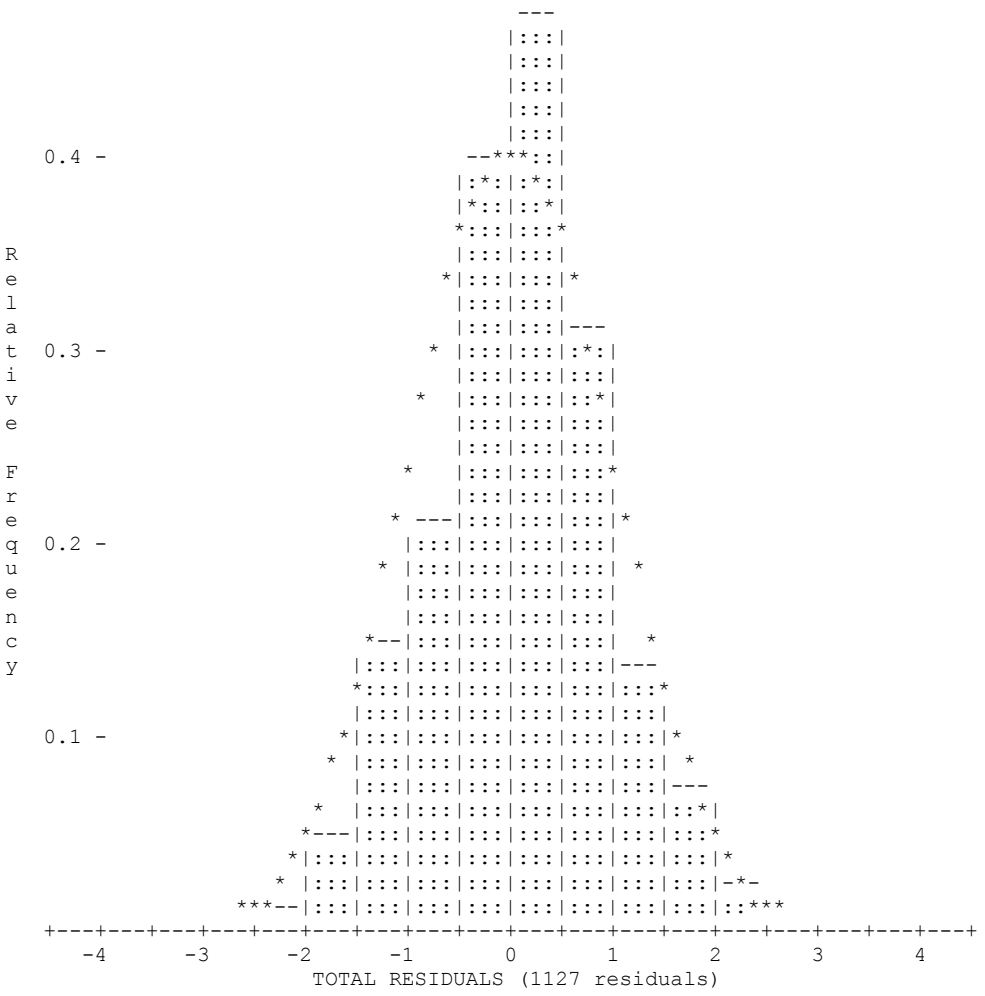


```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS           Page 0065
================================================================================
Residuals (critical value = 4.225):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                    OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO                       STD DEV  STD DEV      PPM
---- ------------ ------------ ------------ ----------------- -------- --------
DXCT              7105         MOB7(91)              0.52780   0.0001   0.1900
                                                      0.0020   0.0003    20.13
DYCT              7105         MOB7(91)             -2.39560  -0.0003  -0.1900
                                                      0.0020   0.0014    86.03
DZCT              7105         MOB7(91)              1.97480   0.0002   0.1900
                                                      0.0020   0.0012    71.60
DXCT              7105         MOB7(92)              0.52710   0.0000  -0.0056
                                                      0.0020   0.0003     0.57
DYCT              7105         MOB7(92)             -2.38680   0.0000   0.0056
                                                      0.0020   0.0014     2.43
DZCT              7105         MOB7(92)              1.96860   0.0000  -0.0056
                                                      0.0020   0.0011     2.02
DXCT              7105         MOB7(01)              0.52570  -0.0004  -0.2103
                                                      0.0020   0.0019   128.04
DYCT              7105         MOB7(01)             -2.38680   0.0002   0.0799
                                                      0.0020   0.0019    48.42
DZCT              7105         MOB7(01)              1.97010  -0.0009  -0.4610
                                                      0.0020   0.0019   280.42
DXCT              7105         MOB7(03)              0.52560  -0.0008  -0.4083
                                                      0.0020   0.0019   248.89
DYCT              7105         MOB7(03)             -2.38620   0.0002   0.0774
                                                      0.0020   0.0019    47.96
DZCT              7105         MOB7(03)              1.97090   0.0001   0.0266
                                                      0.0020   0.0019    16.46
DXCT              MV3(02PRE)   MV3(02)               0.00600   0.0002   0.1414
                                                      0.0020   0.0014  4534.81
DYCT              MV3(02PRE)   MV3(02)               0.04290  -0.0001  -0.0707
                                                      0.0020   0.0014  2267.40
DZCT              MV3(02PRE)   MV3(02)               0.00890  -0.0003  -0.1768
                                                      0.0020   0.0014  5668.51
DXCT              MV3(02PRE)   MV3(02)               0.00640  -0.0002  -0.1414
                                                      0.0020   0.0014  4534.81
DYCT              MV3(02PRE)   MV3(02)               0.04270   0.0001   0.0707
                                                      0.0020   0.0014  2267.40
DZCT              MV3(02PRE)   MV3(02)               0.00840   0.0003   0.1768
                                                      0.0020   0.0014  5668.51
DXCT              MV3(03PRE)   MV3(03)              -0.03570   0.0000   0.0000
                                                      0.0020   0.0000        *
DYCT              MV3(03PRE)   MV3(03)               0.17470   0.0000   0.0000
                                                      0.0020   0.0000        *
DZCT              MV3(03PRE)   MV3(03)              -0.14060   0.0000   0.0000
                                                      0.0020   0.0000     0.00*
DXCT              DORIS PIER   DORIS GREB            0.09170   0.0000   0.0000
                                                      0.0005   0.0000     0.00*
DYCT              DORIS PIER   DORIS GREB           -0.39190   0.0000   0.0000
                                                      0.0005   0.0000     0.00*
DZCT              DORIS PIER   DORIS GREB            0.32610   0.0000   0.0000
                                                      0.0005   0.0000     0.00*
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0066
================================================================================
```



```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0067
================================================================================
```



```
================================================================================
                          GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0068
================================================================================

 ------------------------------------------------------------------------------
|                                                                              |
|                   S T A T I S T I C S     S U M M A R Y                      |
|                                                                              |
 ------------------------------------------------------------------------------
|                                  |                                           |
|     Residual Critical Value Type |                Tau Max                    |
|     Residual Critical Value      |                 4.2250                    |
|     Number of Flagged Residuals  |                      1                    |
|     Convergence Criterion        |                 0.0010                    |
|     Final Iteration Counter Value|                      3                    |
|     Confidence Level Used        |                95.0000                    |
|     Estimated Variance Factor    |                 0.9694                    |
|     Number of Degrees of Freedom |                    948                    |
|                                  |                                           |
 ------------------------------------------------------------------------------
|                                                                              |
|                  Chi-Square Test on the Variance Factor:                     |
|                                                                              |
|                   8.8775e-01  <  1.0000  <  1.0630e+00  ?                    |
|                                                                              |
|                             THE TEST PASSES                                  |
|                                                                              |
 ------------------------------------------------------------------------------

 ------------------------------------------------------------------------------
|                                                                              |
| NOTE:  All confidence regions were computed using the following factors:     |
|        ---------------------------------------------------------------      |
|        Variance factor used      =          0.9694                          |
|        1-D expansion factor      =          1.9600                          |
|        2-D expansion factor      =          2.4477                          |
|        3-D expansion factor      =          2.7955                          |
|                                                                              |
|        Note that, for relative confidence regions, precisions are            |
|        computed from the ratio of the major semi-axis and the spatial        |
|        distance between the two stations.                                    |
|                                                                              |
 ------------------------------------------------------------------------------
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS

2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):

STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
4005W	0.0018	113	0.0011	0.0008
4006E	0.0019	118	0.0011	0.0008
7108(93)	0.0022	122	0.0012	0.0011
7108RM1	0.0021	130	0.0012	0.0008
7918ECC	0.0015	106	0.0014	0.0015
CAL(A)01	0.0016	135	0.0012	0.0007
CAL(B)01	0.0026	177	0.0015	0.0008
CAL(B)02	0.0020	1	0.0014	0.0008
CAL(C)01	0.0020	16	0.0014	0.0007
CAL(D)98	0.0016	113	0.0013	0.0008
DORIS GREB	0.0021	123	0.0018	0.0014
DORIS PIER	0.0018	123	0.0013	0.0010
GODDARD	0.0015	118	0.0012	0.0010
GODDARD2	0.0016	94	0.0012	0.0010
GORF89	0.0015	104	0.0011	0.0008
MOB7(01)	0.0014	117	0.0012	0.0014
MOB7(03)	0.0014	115	0.0012	0.0009
MOB7(91)	0.0048	0	0.0048	0.0013
MOB7(92)	0.0048	0	0.0048	0.0017
MV3(02)	0.0034	0	0.0034	0.0027
MV3(03)	0.0048	0	0.0048	0.0039
MV3PED	0.0023	121	0.0015	1.1207
NGEOS	0.0014	111	0.0011	0.0005
PIER(A)95	0.0023	118	0.0011	0.0008
PIER(B)95	0.0015	112	0.0011	0.0007
PIER(C)95	0.0021	108	0.0011	0.0008
SGEOS	0.0014	97	0.0011	0.0007
SLR00(03)	0.0017	95	0.0015	0.0012
TLRS4(03)	0.0016	120	0.0013	0.0015

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72                GRS 80            UNITS: m,DMS          Page 0070
================================================================================
3D Station Confidence Regions (95.000 percent):
STATION         MAJ-SEMI (AZ,VANG)    MED-SEMI (AZ,VANG)    MIN-SEMI (AZ,VANG)
------------ -------------------- -------------------- --------------------
4005W             0.0021 (293,  0)      0.0013 ( 23,  0)      0.0011 (198, 90)
4006E             0.0022 (298,  0)      0.0013 ( 28,  0)      0.0012 (204, 90)
7108(93)          0.0026 (302,  0)      0.0016 ( 37, 90)      0.0014 (212,  0)
7108RM1           0.0024 (310,  0)      0.0014 ( 40,  0)      0.0012 (213, 90)
7918ECC           0.0021 (339, 90)      0.0017 (106,  0)      0.0016 (196,  0)
CAL(A)01          0.0019 (315,  0)      0.0014 ( 45,  0)      0.0009 (189, 90)
CAL(B)01          0.0029 (357,  0)      0.0017 (267,  0)      0.0012 (108, 90)
CAL(B)02          0.0023 (  1,  0)      0.0016 (271,  0)      0.0012 (114, 90)
CAL(C)01          0.0022 ( 16,  0)      0.0016 (286,  0)      0.0010 (124, 90)
CAL(D)98          0.0018 (293,  0)      0.0014 ( 23,  0)      0.0011 (182, 90)
DORIS GREB        0.0024 (123,  0)      0.0021 (213,  0)      0.0019 ( 21, 90)
DORIS PIER        0.0020 (303,  0)      0.0015 ( 33,  0)      0.0014 (194, 90)
GODDARD           0.0017 (298,  0)      0.0014 ( 28,  0)      0.0014 (207, 90)
GODDARD2          0.0018 (274,  0)      0.0014 (  5, 90)      0.0014 (184,  0)
GORF89            0.0017 (284,  0)      0.0013 ( 14,  0)      0.0012 (183, 90)
MOB7(01)          0.0019 (317, 90)      0.0016 (117,  0)      0.0013 (207,  0)
MOB7(03)          0.0016 (295,  0)      0.0014 ( 25,  0)      0.0012 (126, 90)
MOB7(91)          0.0055 (225,  0)      0.0055 (315,  0)      0.0018 ( 90, 90)
MOB7(92)          0.0055 (225,  0)      0.0055 (135,  0)      0.0025 (  6, 90)
MV3(02)           0.0039 (274,  3)      0.0039 (  6, 45)      0.0039 (181, 45)
MV3(03)           0.0055 (314, 46)      0.0055 (138, 44)      0.0055 ( 46,  2)
MV3PED            1.5984 (353, 90)      0.0026 (121,  0)      0.0017 (211,  0)
NGEOS             0.0016 (291,  0)      0.0012 ( 21,  0)      0.0007 (182, 90)
PIER(A)95         0.0026 (298,  0)      0.0013 ( 28,  0)      0.0012 (207, 90)
PIER(B)95         0.0018 (292,  0)      0.0012 ( 22,  0)      0.0010 (193, 90)
PIER(C)95         0.0024 (288,  0)      0.0013 ( 18,  0)      0.0012 (197, 90)
SGEOS             0.0016 (277,  0)      0.0013 (  7,  0)      0.0010 (172, 90)
SLR00(03)         0.0019 (275,  0)      0.0017 (  5,  0)      0.0017 (182, 90)
TLRS4(03)         0.0021 (320, 90)      0.0019 (120,  0)      0.0015 (210,  0)
```

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0071

2-D and 1-D Relative Station Confidence Regions (95.000 and 95.000 percent):

FROM	TO	MAJ-SEMI	AZ	MIN-SEMI	VERTICAL	DISTANCE	PPM
4005W	4006E	0.0005	171	0.0005	0.0005	23.1531	20.93
4005W	7108(93)	0.0010	137	0.0006	0.0009	54.9350	18.77
4005W	7108RM1	0.0009	172	0.0005	0.0006	73.8264	11.65
4005W	CAL(A)01	0.0009	59	0.0005	0.0007	85.5511	10.62
4005W	NGEOS	0.0009	114	0.0004	0.0006	87.1770	10.01
4005W	PIER(A)95	0.0008	130	0.0005	0.0005	78.1165	10.70
4005W	PIER(B)95	0.0007	113	0.0004	0.0006	55.2230	12.02
4005W	PIER(C)95	0.0006	89	0.0004	0.0005	44.0547	13.37
4006E	7108(93)	0.0009	127	0.0006	0.0009	33.2256	27.89
4006E	7108RM1	0.0007	174	0.0005	0.0006	50.9267	13.83
4006E	GODDARD	0.0015	133	0.0006	0.0011	143.3299	10.35
4006E	NGEOS	0.0010	124	0.0004	0.0007	103.2428	9.71
4006E	PIER(A)95	0.0007	116	0.0005	0.0005	60.1212	11.72
4006E	PIER(B)95	0.0008	126	0.0004	0.0007	71.5644	11.05
4006E	PIER(C)95	0.0006	62	0.0004	0.0006	43.8918	13.98
7105	GODDARD2	0.0016	94	0.0012	0.0010	50.5584	30.89
7105	MOB7(01)	0.0014	117	0.0012	0.0014	3.1384	456.71
7105	MOB7(03)	0.0014	115	0.0012	0.0009	3.1390	455.29
7105	MOB7(91)	0.0048	0	0.0048	0.0013	3.1495	1530.41
7105	MOB7(92)	0.0048	0	0.0048	0.0017	3.1385	1535.81
7105	MV3(02)	0.0034	0	0.0034	0.0027	177.4084	19.21
7105	MV3(03)	0.0048	0	0.0048	0.0039	177.3879	27.17
7105	NGEOS	0.0014	111	0.0011	0.0005	42.6203	33.49
7105	SGEOS	0.0014	97	0.0011	0.0007	50.8781	28.24
7108(93)	7108RM1	0.0009	131	0.0007	0.0009	31.1906	29.23
7108(93)	CAL(A)01	0.0012	103	0.0007	0.0010	101.6439	12.29
7108(93)	NGEOS	0.0015	127	0.0006	0.0010	135.6305	10.84
7108(93)	PIER(A)95	0.0009	121	0.0006	0.0008	30.7251	30.88
7108(93)	PIER(B)95	0.0013	129	0.0006	0.0010	104.3190	12.28
7108(93)	PIER(C)95	0.0009	136	0.0007	0.0008	49.4708	18.03
7108RM1	CAL(A)01	0.0010	116	0.0006	0.0007	89.0908	10.98
7108RM1	MV3PED	0.0011	14	0.0011	1.1207	31.4212	35.37
7108RM1	NGEOS	0.0013	141	0.0004	0.0007	140.8875	9.57
7108RM1	PIER(A)95	0.0007	62	0.0005	0.0006	52.3480	12.74
7108RM1	PIER(B)95	0.0012	147	0.0004	0.0007	112.2182	10.25
7108RM1	PIER(C)95	0.0009	23	0.0005	0.0006	79.9740	11.17
7918ECC	CAL(A)01	0.0015	172	0.0008	0.0014	115.1065	13.02
7918ECC	CAL(B)02	0.0021	9	0.0007	0.0015	190.1288	11.21
7918ECC	CAL(C)01	0.0021	17	0.0008	0.0015	187.3304	11.20
7918ECC	CAL(D)98	0.0011	98	0.0010	0.0015	75.8709	14.68
7918ECC	GODDARD2	0.0012	11	0.0010	0.0016	39.0838	29.73
7918ECC	NGEOS	0.0011	2	0.0008	0.0014	41.1423	27.45
CAL(A)01	CAL(B)01	0.0017	14	0.0007	0.0007	129.7005	12.97
CAL(A)01	CAL(B)02	0.0011	34	0.0004	0.0006	99.1534	10.95
CAL(A)01	CAL(C)01	0.0012	50	0.0004	0.0005	112.3016	10.76
CAL(A)01	DORIS PIER	0.0019	141	0.0008	0.0010	154.6595	12.13
CAL(A)01	GORF89	0.0013	141	0.0006	0.0008	130.3051	10.32
CAL(A)01	MOB7(01)	0.0012	156	0.0004	0.0014	106.6445	11.01
CAL(A)01	MOB7(03)	0.0012	153	0.0007	0.0010	106.6441	11.53
CAL(A)01	NGEOS	0.0008	176	0.0004	0.0004	78.9552	10.17
CAL(A)01	PIER(A)95	0.0013	94	0.0005	0.0007	132.2007	9.50
CAL(A)01	PIER(B)95	0.0007	18	0.0004	0.0006	68.0940	10.63
CAL(A)01	SGEOS	0.0013	134	0.0006	0.0007	121.2482	10.70
CAL(A)01	SLR00(03)	0.0015	136	0.0011	0.0012	113.5535	12.91
CAL(B)01	CAL(C)01	0.0012	165	0.0008	0.0006	74.2859	16.44
CAL(B)01	MOB7(01)	0.0024	179	0.0007	0.0014	220.0852	11.07
CAL(B)01	NGEOS	0.0022	9	0.0006	0.0006	204.8845	10.80
CAL(B)01	PIER(B)95	0.0022	15	0.0007	0.0008	197.7768	10.94
CAL(B)02	CAL(C)01	0.0007	26	0.0005	0.0006	28.8951	23.05
CAL(B)02	CAL(D)98	0.0021	167	0.0006	0.0009	202.0135	10.56
CAL(B)02	GORF89	0.0018	173	0.0005	0.0010	175.5120	10.28
CAL(B)02	MOB7(01)	0.0018	4	0.0005	0.0014	174.8027	10.29

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS

2-D and 1-D Relative Station Confidence Regions (95.000 and 95.000 percent):

FROM	TO	MAJ-SEMI	AZ	MIN-SEMI	VERTICAL	DISTANCE	PPM
CAL(B)02	MOB7(03)	0.0018	5	0.0007	0.0011	174.8032	10.33
CAL(B)02	NGEOS	0.0016	19	0.0004	0.0007	165.7125	9.74
CAL(B)02	PIER(A)95	0.0019	67	0.0007	0.0009	205.9612	9.07
CAL(B)02	PIER(B)95	0.0016	29	0.0004	0.0008	164.8940	9.78
CAL(B)02	PIER(C)95	0.0020	54	0.0006	0.0009	216.3678	9.24
CAL(B)02	SGEOS	0.0017	170	0.0005	0.0009	158.6903	10.57
CAL(B)02	SLR00(03)	0.0019	175	0.0010	0.0013	156.7610	11.89
CAL(C)01	CAL(D)98	0.0020	174	0.0007	0.0008	188.3239	10.59
CAL(C)01	MOB7(01)	0.0018	14	0.0004	0.0014	170.4976	10.34
CAL(C)01	MOB7(03)	0.0018	15	0.0008	0.0010	170.4984	10.36
CAL(C)01	NGEOS	0.0017	30	0.0004	0.0005	168.6046	9.79
CAL(C)01	PIER(A)95	0.0021	72	0.0006	0.0008	229.2754	9.14
CAL(C)01	PIER(B)95	0.0017	39	0.0004	0.0007	173.1769	9.79
CAL(C)01	PIER(C)95	0.0022	60	0.0006	0.0008	234.9766	9.29
CAL(C)01	SGEOS	0.0016	0	0.0006	0.0008	146.4208	10.72
CAL(C)01	SLR00(03)	0.0018	6	0.0010	0.0012	146.2548	12.18
CAL(D)98	DORIS PIER	0.0012	146	0.0008	0.0008	6.2652	183.84
CAL(D)98	GORF89	0.0007	144	0.0006	0.0008	30.5596	23.60
CAL(D)98	NGEOS	0.0013	124	0.0008	0.0006	109.3457	11.80
CAL(D)98	SGEOS	0.0008	159	0.0006	0.0006	43.7751	19.25
CAL(D)98	SLR00(03)	0.0013	159	0.0011	0.0010	48.6191	27.62
DORIS GREB	DORIS PIER	0.0012	0	0.0012	0.0010	0.5180	2326.24
DORIS PIER	GORF89	0.0011	143	0.0007	0.0010	24.3797	43.39
DORIS PIER	NGEOS	0.0015	130	0.0009	0.0008	104.2975	14.29
DORIS PIER	SGEOS	0.0011	149	0.0007	0.0008	37.6844	30.30
GODDARD	GODDARD2	0.0010	115	0.0009	0.0010	36.2274	27.73
GODDARD	GORF89	0.0010	137	0.0009	0.0011	65.0934	15.61
GODDARD	MOB7(03)	0.0009	148	0.0008	0.0012	28.5659	30.27
GODDARD	NGEOS	0.0008	148	0.0005	0.0008	44.0726	19.16
GODDARD	PIER(B)95	0.0010	140	0.0005	0.0010	72.4304	13.97
GODDARD	SGEOS	0.0010	135	0.0010	0.0010	76.9603	13.35
GODDARD	TLRS4(03)	0.0012	155	0.0009	0.0016	45.2093	25.60
GODDARD2	MOB7(03)	0.0011	79	0.0008	0.0012	50.7782	22.07
GODDARD2	NGEOS	0.0009	42	0.0007	0.0008	24.8503	34.50
GODDARD2	PIER(B)95	0.0009	31	0.0008	0.0010	40.0260	22.02
GODDARD2	SGEOS	0.0013	74	0.0009	0.0010	100.3928	12.96
GODDARD2	TLRS4(03)	0.0011	39	0.0010	0.0016	30.4561	37.38
GORF89	NGEOS	0.0009	113	0.0006	0.0007	83.4661	10.99
GORF89	PIER(B)95	0.0012	112	0.0006	0.0009	114.7318	10.11
GORF89	SGEOS	0.0005	153	0.0005	0.0007	18.4765	27.94
GORF89	SLR00(03)	0.0011	29	0.0010	0.0012	19.4424	57.03
MOB7(01)	MOB7(03)	0.0009	156	0.0007	0.0016	0.0019	484759.6
MOB7(01)	MOB7(91)	0.0050	117	0.0050	0.0019	0.0112	449154.2
MOB7(01)	MOB7(92)	0.0050	117	0.0050	0.0022	0.0019	2630957
MOB7(01)	MV3(02)	0.0037	117	0.0036	0.0030	177.4813	20.83
MOB7(01)	MV3(02PRE)	0.0014	117	0.0012	0.0014	177.4453	8.08
MOB7(01)	MV3(03)	0.0050	117	0.0050	0.0041	177.4831	28.33
MOB7(01)	MV3(03PRE)	0.0014	117	0.0012	0.0014	177.4709	8.08
MOB7(01)	NGEOS	0.0007	143	0.0005	0.0013	42.7735	16.34
MOB7(01)	PIER(B)95	0.0009	127	0.0005	0.0014	74.7784	11.61
MOB7(03)	MOB7(91)	0.0050	115	0.0050	0.0015	0.0111	454556.0
MOB7(03)	MOB7(92)	0.0050	115	0.0050	0.0019	0.0034	1495043
MOB7(03)	MV3(02)	0.0037	115	0.0036	0.0029	177.4801	20.82
MOB7(03)	MV3(02PRE)	0.0014	115	0.0012	0.0009	177.4441	8.05
MOB7(03)	MV3(03)	0.0050	115	0.0050	0.0040	177.4818	28.33
MOB7(03)	MV3(03PRE)	0.0014	115	0.0012	0.0009	177.4696	8.05
MOB7(03)	NGEOS	0.0008	124	0.0006	0.0009	42.7721	19.14
MOB7(03)	PIER(B)95	0.0010	120	0.0007	0.0010	74.7770	13.34
MOB7(03)	TLRS4(03)	0.0011	126	0.0009	0.0016	39.8111	28.40
MOB7(91)	MOB7(92)	0.0068	0	0.0068	0.0022	0.0112	611226.9
MOB7(91)	MV3(02)	0.0059	0	0.0059	0.0030	177.4826	33.26
MOB7(91)	MV3(02PRE)	0.0048	0	0.0048	0.0013	177.4466	27.16

GGAO SITE SURVEY 2000-2003

GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0073

2-D and 1-D Relative Station Confidence Regions (95.000 and 95.000 percent):

FROM	TO	MAJ-SEMI	AZ	MIN-SEMI	VERTICAL	DISTANCE	PPM
MOB7(91)	MV3(03)	0.0068	0	0.0068	0.0041	177.4845	38.41
MOB7(91)	MV3(03PRE)	0.0048	0	0.0048	0.0013	177.4722	27.16
MOB7(92)	MV3(02)	0.0059	0	0.0059	0.0032	177.4811	33.26
MOB7(92)	MV3(02PRE)	0.0048	0	0.0048	0.0017	177.4451	27.16
MOB7(92)	MV3(03)	0.0068	0	0.0068	0.0042	177.4828	38.41
MOB7(92)	MV3(03PRE)	0.0048	0	0.0048	0.0017	177.4706	27.16
MV3(02)	MV3(02PRE)	0.0034	0	0.0034	0.0027	0.0441	77280.04
MV3(02)	MV3(03)	0.0059	0	0.0059	0.0047	1.2576	4694.12
MV3(02)	MV3(03PRE)	0.0034	0	0.0034	0.0027	1.0309	3306.22
MV3(02PRE)	MV3(03)	0.0048	0	0.0048	0.0039	1.2830	3756.87
MV3(03)	MV3(03PRE)	0.0048	0	0.0048	0.0039	0.2271	21226.81
MV3PED	PIER(A)95	0.0011	108	0.0011	1.1207	30.9090	35.39
MV3PED	PIER(C)95	0.0012	20	0.0011	1.1207	49.6581	23.23
NGEOS	PIER(A)95	0.0015	122	0.0004	0.0007	163.2366	8.99
NGEOS	PIER(B)95	0.0004	117	0.0003	0.0005	32.0303	12.72
NGEOS	PIER(C)95	0.0012	105	0.0004	0.0007	128.8614	9.39
NGEOS	SGEOS	0.0010	100	0.0007	0.0005	86.2524	11.13
NGEOS	TLRS4(03)	0.0009	144	0.0008	0.0014	6.4266	138.42
PIER(A)95	PIER(B)95	0.0012	123	0.0004	0.0007	131.3878	9.43
PIER(A)95	PIER(C)95	0.0006	163	0.0005	0.0005	53.4160	11.55
PIER(B)95	PIER(C)95	0.0010	102	0.0004	0.0007	97.5738	10.15
PIER(B)95	SGEOS	0.0012	103	0.0007	0.0008	115.7175	10.25
PIER(B)95	SLR00(03)	0.0014	95	0.0011	0.0012	105.6830	13.20
PIER(B)95	TLRS4(03)	0.0010	125	0.0009	0.0015	35.5635	26.92
SGEOS	SLR00(03)	0.0011	23	0.0010	0.0010	10.6955	101.67

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0074
================================================================================
3D Relative Confidence Regions (95.000 percent):
FROM         TO           MAJ-SEMI(AZ,VANG) MED-SEMI(AZ,VANG) MIN-SEMI(AZ,VANG)
                                                  DISTANCE              PPM
------------ ------------ ----------------- ----------------- -----------------
4005W        4006E          0.0007 (347,90)   0.0006 (171, 0)   0.0005 ( 81, 0)
                                                    23.1531             31.97
4005W        7108(93)       0.0013 (  2,90)   0.0012 (137, 0)   0.0007 (227, 0)
                                                    54.9350             23.18
4005W        7108RM1        0.0010 (352, 0)   0.0008 (182,90)   0.0005 ( 82, 0)
                                                    73.8264             13.31
4005W        CAL(A)01       0.0010 ( 59, 0)   0.0009 (265,90)   0.0006 (149, 0)
                                                    85.5511             12.13
4005W        NGEOS          0.0010 (114, 0)   0.0009 (280,90)   0.0005 ( 24, 0)
                                                    87.1770             11.44
4005W        PIER(A)95      0.0010 (130, 0)   0.0008 (357,90)   0.0005 (220, 0)
                                                    78.1165             12.22
4005W        PIER(B)95      0.0009 ( 57,90)   0.0008 (293, 0)   0.0005 (203, 0)
                                                    55.2230             16.12
4005W        PIER(C)95      0.0007 (269,90)   0.0007 ( 89, 0)   0.0005 (179, 0)
                                                    44.0547             16.49
4006E        7108(93)       0.0013 (186,90)   0.0011 (307, 0)   0.0007 ( 37, 0)
                                                    33.2256             39.19
4006E        7108RM1        0.0009 (351,90)   0.0008 (174, 0)   0.0006 ( 84, 0)
                                                    50.9267             17.58
4006E        GODDARD        0.0017 (133, 0)   0.0015 (  0,90)   0.0007 ( 43, 0)
                                                   143.3299             11.82
4006E        NGEOS          0.0011 (124, 0)   0.0009 (326,90)   0.0005 (214, 0)
                                                   103.2428             11.09
4006E        PIER(A)95      0.0008 (116, 0)   0.0008 (282,90)   0.0005 ( 26, 0)
                                                    60.1212             13.38
4006E        PIER(B)95      0.0010 ( 91,90)   0.0009 (306, 0)   0.0005 (216, 0)
                                                    71.5644             14.16
4006E        PIER(C)95      0.0008 (252,90)   0.0007 ( 62, 0)   0.0005 (152, 0)
                                                    43.8918             17.92
7105         GODDARD2       0.0018 (274, 0)   0.0014 (  5,90)   0.0014 (184, 0)
                                                    50.5584             35.28
7105         MOB7(01)       0.0019 (317,90)   0.0016 (117, 0)   0.0013 (207, 0)
                                                     3.1384            618.01
7105         MOB7(03)       0.0016 (295, 0)   0.0014 ( 25, 0)   0.0012 (126,90)
                                                     3.1390            519.97
7105         MOB7(91)       0.0055 (225, 0)   0.0055 (315, 0)   0.0018 ( 90,90)
                                                     3.1495           1747.82
7105         MOB7(92)       0.0055 (225, 0)   0.0055 (135, 0)   0.0025 (  6,90)
                                                     3.1385           1753.99
7105         MV3(02)        0.0039 (274, 3)   0.0039 (  6,45)   0.0039 (181,45)
                                                   177.4084             21.94
7105         MV3(03)        0.0055 (314,46)   0.0055 (138,44)   0.0055 ( 46, 2)
                                                   177.3879             31.03
7105         NGEOS          0.0016 (291, 0)   0.0012 ( 21, 0)   0.0007 (182,90)
                                                    42.6203             38.24
7105         SGEOS          0.0016 (277, 0)   0.0013 (  7, 0)   0.0010 (172,90)
                                                    50.8781             32.25
7108(93)     7108RM1        0.0012 (168,90)   0.0010 (311, 0)   0.0008 ( 41, 0)
                                                    31.1906             39.83
7108(93)     CAL(A)01       0.0014 (103,90)   0.0014 (283, 0)   0.0008 ( 13, 0)
                                                   101.6439             14.08
7108(93)     NGEOS          0.0017 (127, 0)   0.0014 (332,90)   0.0007 (217, 0)
                                                   135.6305             12.38
7108(93)     PIER(A)95      0.0012 (354,90)   0.0011 (121, 0)   0.0007 (211, 0)
                                                    30.7251             39.45
7108(93)     PIER(B)95      0.0015 (129, 0)   0.0014 (310,90)   0.0007 (219, 0)
                                                   104.3190             14.03
7108(93)     PIER(C)95      0.0012 (162,90)   0.0010 (316, 0)   0.0009 ( 46, 0)
                                                    49.4708             24.51
7108RM1      CAL(A)01       0.0011 (296, 0)   0.0010 ( 48,90)   0.0007 (206, 0)
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0075
================================================================================
3D Relative Confidence Regions (95.000 percent):
FROM         TO           MAJ-SEMI(AZ,VANG) MED-SEMI(AZ,VANG) MIN-SEMI(AZ,VANG)
                                                  DISTANCE              PPM
------------ ------------ ----------------- ----------------- -----------------
                                                   89.0908             12.54
7108RM1      MV3PED         1.5984 ( 31,90)   0.0013 (194, 0)   0.0012 (284, 0)
                                                   31.4212          50869.38
7108RM1      NGEOS          0.0015 (321, 0)   0.0009 ( 54,90)   0.0005 (231, 0)
                                                  140.8875             10.93
7108RM1      PIER(A)95      0.0009 ( 43,90)   0.0008 (242, 0)   0.0006 (152, 0)
                                                   52.3480             16.73
7108RM1      PIER(B)95      0.0013 (147, 0)   0.0010 (343,90)   0.0005 (237, 0)
                                                  112.2182             11.71
7108RM1      PIER(C)95      0.0010 (203, 0)   0.0009 ( 26,90)   0.0005 (293, 0)
                                                   79.9740             12.76
7918ECC      CAL(A)01       0.0020 (175,90)   0.0017 (352, 0)   0.0009 ( 82, 0)
                                                  115.1065             17.75
7918ECC      CAL(B)02       0.0024 (  9, 0)   0.0022 (196,90)   0.0008 ( 99, 0)
                                                  190.1288             12.80
7918ECC      CAL(C)01       0.0024 ( 17, 0)   0.0021 (217,90)   0.0009 (107, 0)
                                                  187.3304             12.79
7918ECC      CAL(D)98       0.0021 (303,90)   0.0013 ( 98, 0)   0.0011 (188, 0)
                                                   75.8709             28.31
7918ECC      GODDARD2       0.0023 (353,90)   0.0013 (191, 0)   0.0012 (101, 0)
                                                   39.0838             58.39
7918ECC      NGEOS          0.0019 (  1,90)   0.0013 (182, 0)   0.0009 ( 92, 0)
                                                   41.1423             47.31
CAL(A)01     CAL(B)01       0.0019 ( 14, 0)   0.0009 (129,90)   0.0008 (284, 0)
                                                  129.7005             14.81
CAL(A)01     CAL(B)02       0.0012 ( 34, 0)   0.0009 (177,90)   0.0005 (304, 0)
                                                   99.1534             12.50
CAL(A)01     CAL(C)01       0.0014 ( 50, 0)   0.0007 (312,90)   0.0005 (140, 0)
                                                  112.3016             12.29
CAL(A)01     DORIS PIER     0.0021 (321, 0)   0.0014 (113,90)   0.0009 (231, 0)
                                                  154.6595             13.86
CAL(A)01     GORF89         0.0015 (321, 0)   0.0012 (134,90)   0.0006 (231, 0)
                                                  130.3051             11.79
CAL(A)01     MOB7(01)       0.0019 (162,90)   0.0013 (336, 0)   0.0005 ( 66, 0)
                                                  106.6445             18.18
CAL(A)01     MOB7(03)       0.0014 (154,90)   0.0014 (333, 0)   0.0008 ( 63, 0)
                                                  106.6441             13.33
CAL(A)01     NGEOS          0.0009 (356, 0)   0.0006 (166,90)   0.0004 (266, 0)
                                                   78.9552             11.62
CAL(A)01     PIER(A)95      0.0014 ( 94, 0)   0.0010 (312,90)   0.0005 (184, 0)
                                                  132.2007             10.85
CAL(A)01     PIER(B)95      0.0009 ( 12,90)   0.0008 (198, 0)   0.0004 (108, 0)
                                                   68.0940             12.95
CAL(A)01     SGEOS          0.0015 (314, 0)   0.0010 (127,90)   0.0007 (224, 0)
                                                  121.2482             12.22
CAL(A)01     SLR00(03)      0.0017 (316,90)   0.0017 (136, 0)   0.0012 (226, 0)
                                                  113.5535             14.75
CAL(B)01     CAL(C)01       0.0014 (345, 0)   0.0009 (220,90)   0.0009 ( 75, 0)
                                                   74.2859             18.77
CAL(B)01     MOB7(01)       0.0028 (179, 0)   0.0021 (359,90)   0.0008 (269, 0)
                                                  220.0852             12.64
CAL(B)01     NGEOS          0.0025 (  9, 0)   0.0009 (163,90)   0.0007 (279, 0)
                                                  204.8845             12.33
CAL(B)01     PIER(B)95      0.0025 ( 15, 0)   0.0012 (226,90)   0.0008 (105, 0)
                                                  197.7768             12.50
CAL(B)02     CAL(C)01       0.0009 ( 29,90)   0.0008 (206, 0)   0.0006 (296, 0)
                                                   28.8951             29.74
CAL(B)02     CAL(D)98       0.0024 (347, 0)   0.0013 (170,90)   0.0007 ( 77, 0)
                                                  202.0135             12.06
CAL(B)02     GORF89         0.0021 (353, 0)   0.0014 (179,90)   0.0006 ( 83, 0)
                                                  175.5120             11.74
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0076
================================================================================
3D Relative Confidence Regions (95.000 percent):
FROM         TO           MAJ-SEMI(AZ,VANG) MED-SEMI(AZ,VANG) MIN-SEMI(AZ,VANG)
                                                DISTANCE              PPM
------------ ------------ ----------------- ----------------- -----------------
CAL(B)02     MOB7(01)       0.0021 (184,90)   0.0021 (  4, 0)   0.0006 (274, 0)
                                                174.8027             11.82
CAL(B)02     MOB7(03)       0.0021 (185, 0)   0.0016 (359,90)   0.0008 ( 95, 0)
                                                174.8032             11.79
CAL(B)02     NGEOS          0.0018 ( 19, 0)   0.0009 (266,90)   0.0004 (109, 0)
                                                165.7125             11.12
CAL(B)02     PIER(A)95      0.0021 ( 67, 0)   0.0013 (281,90)   0.0008 (157, 0)
                                                205.9612             10.36
CAL(B)02     PIER(B)95      0.0018 ( 29, 0)   0.0012 (293,90)   0.0005 (119, 0)
                                                164.8940             11.17
CAL(B)02     PIER(C)95      0.0023 (234, 0)   0.0013 ( 75,90)   0.0007 (324, 0)
                                                216.3678             10.55
CAL(B)02     SGEOS          0.0019 (350, 0)   0.0012 (174,90)   0.0006 ( 80, 0)
                                                158.6903             12.07
CAL(B)02     SLR00(03)      0.0021 (355, 0)   0.0018 (175,90)   0.0012 ( 85, 0)
                                                156.7610             13.58
CAL(C)01     CAL(D)98       0.0023 (354, 0)   0.0012 (200,90)   0.0008 ( 84, 0)
                                                188.3239             12.10
CAL(C)01     MOB7(01)       0.0020 (194, 0)   0.0020 ( 14,90)   0.0005 (284, 0)
                                                170.4976             11.81
CAL(C)01     MOB7(03)       0.0020 (195, 0)   0.0015 ( 12,90)   0.0009 (105, 0)
                                                170.4984             11.83
CAL(C)01     NGEOS          0.0019 (210, 0)   0.0008 (117,90)   0.0005 (300, 0)
                                                168.6046             11.18
CAL(C)01     PIER(A)95      0.0024 ( 72, 0)   0.0011 (214,90)   0.0007 (342, 0)
                                                229.2754             10.44
CAL(C)01     PIER(B)95      0.0019 (219, 0)   0.0010 (323,90)   0.0005 (129, 0)
                                                173.1769             11.19
CAL(C)01     PIER(C)95      0.0025 (240, 0)   0.0012 (122,90)   0.0007 (330, 0)
                                                234.9766             10.61
CAL(C)01     SGEOS          0.0018 (  0, 0)   0.0011 (207,90)   0.0007 ( 90, 0)
                                                146.4208             12.24
CAL(C)01     SLR00(03)      0.0020 (  6, 0)   0.0017 (191,90)   0.0012 ( 96, 0)
                                                146.2548             13.91
CAL(D)98     DORIS PIER     0.0013 (326, 0)   0.0012 (141,90)   0.0009 (236, 0)
                                                  6.2652            209.96
CAL(D)98     GORF89         0.0011 (329,90)   0.0008 (144, 0)   0.0007 (234, 0)
                                                 30.5596             35.29
CAL(D)98     NGEOS          0.0015 (304, 0)   0.0009 ( 39,90)   0.0009 (214, 0)
                                                109.3457             13.48
CAL(D)98     SGEOS          0.0010 (339, 0)   0.0009 (153,90)   0.0007 (249, 0)
                                                 43.7751             21.99
CAL(D)98     SLR00(03)      0.0015 (339, 0)   0.0014 (160,90)   0.0013 ( 69, 0)
                                                 48.6191             31.54
DORIS GREB   DORIS PIER     0.0014 ( 89, 7)   0.0014 (333,74)   0.0014 (181,15)
                                                  0.5180           2656.71
DORIS PIER   GORF89         0.0014 (328,90)   0.0012 (143, 0)   0.0008 (233, 0)
                                                 24.3797             56.14
DORIS PIER   NGEOS          0.0017 (310, 0)   0.0012 ( 78,90)   0.0010 (220, 0)
                                                104.2975             16.32
DORIS PIER   SGEOS          0.0013 (329, 0)   0.0011 (140,90)   0.0008 (239, 0)
                                                 37.6844             34.60
GODDARD      GODDARD2       0.0014 (  0,90)   0.0011 (115, 0)   0.0011 ( 25, 0)
                                                 36.2274             37.99
GODDARD      GORF89         0.0015 (320,90)   0.0012 (137, 0)   0.0010 (227, 0)
                                                 65.0934             23.60
GODDARD      MOB7(03)       0.0017 (167,90)   0.0010 (328, 0)   0.0009 ( 58, 0)
                                                 28.5659             61.19
GODDARD      NGEOS          0.0012 (292,90)   0.0010 (148, 0)   0.0006 ( 58, 0)
                                                 44.0726             27.04
GODDARD      PIER(B)95      0.0014 (333,90)   0.0012 (140, 0)   0.0006 (230, 0)
```

```
================================================================================
                        GGAO SITE SURVEY 2000-2003
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0077
================================================================================
3D Relative Confidence Regions (95.000 percent):
FROM         TO           MAJ-SEMI(AZ,VANG) MED-SEMI(AZ,VANG) MIN-SEMI(AZ,VANG)
                                                  DISTANCE              PPM
------------ ------------ ----------------- ----------------- -----------------
                                                    72.4304             19.58
GODDARD      SGEOS          0.0014 (303,90)   0.0012 (135, 0)   0.0011 ( 45, 0)
                                                    76.9603             18.42
GODDARD      TLRS4(03)      0.0023 (207,90)   0.0013 (335, 0)   0.0010 ( 65, 0)
                                                    45.2093             50.48
GODDARD2     MOB7(03)       0.0017 (194,90)   0.0013 ( 79, 0)   0.0009 (349, 0)
                                                    50.7782             34.42
GODDARD2     NGEOS          0.0012 ( 16,90)   0.0010 (222, 0)   0.0008 (132, 0)
                                                    24.8503             47.96
GODDARD2     PIER(B)95      0.0014 (  2,90)   0.0010 (211, 0)   0.0009 (121, 0)
                                                    40.0260             35.42
GODDARD2     SGEOS          0.0015 (254, 0)   0.0014 ( 49,90)   0.0011 (164, 0)
                                                   100.3928             14.80
GODDARD2     TLRS4(03)      0.0023 (224,90)   0.0013 ( 39, 0)   0.0011 (129, 0)
                                                    30.4561             74.93
GORF89       NGEOS          0.0010 (293, 0)   0.0010 (102,90)   0.0007 (203, 0)
                                                    83.4661             12.56
GORF89       PIER(B)95      0.0013 (292, 0)   0.0012 (106,90)   0.0007 (202, 0)
                                                   114.7318             11.54
GORF89       SGEOS          0.0010 (176,90)   0.0006 (333, 0)   0.0006 ( 63, 0)
                                                    18.4765             51.95
GORF89       SLR00(03)      0.0017 (163,90)   0.0013 ( 29, 0)   0.0012 (299, 0)
                                                    19.4424             85.33
MOB7(01)     MOB7(03)       0.0022 (179,90)   0.0010 (336, 0)   0.0008 ( 66, 0)
                                                     0.0019           1173398
MOB7(01)     MOB7(91)       0.0057 (297, 0)   0.0057 (207, 0)   0.0027 (115,90)
                                                     0.0112         512962.8
MOB7(01)     MOB7(92)       0.0057 (117, 0)   0.0057 (207, 0)   0.0031 (  8,90)
                                                     0.0019          3004721
MOB7(01)     MV3(02)        0.0043 (202,90)   0.0042 (297, 0)   0.0041 ( 27, 0)
                                                   177.4813             24.50
MOB7(01)     MV3(02PRE)     0.0019 (317,90)   0.0016 (117, 0)   0.0013 (207, 0)
                                                   177.4453             10.93
MOB7(01)     MV3(03)        0.0058 (190,90)   0.0057 (297, 0)   0.0057 ( 27, 0)
                                                   177.4831             32.89
MOB7(01)     MV3(03PRE)     0.0019 (317,90)   0.0016 (117, 0)   0.0013 (207, 0)
                                                   177.4709             10.93
MOB7(01)     NGEOS          0.0018 (170,90)   0.0008 (323, 0)   0.0006 ( 53, 0)
                                                    42.7735             42.94
MOB7(01)     PIER(B)95      0.0020 (159,90)   0.0010 (307, 0)   0.0006 ( 37, 0)
                                                    74.7784             26.62
MOB7(03)     MOB7(91)       0.0057 (295, 0)   0.0057 (205, 0)   0.0022 ( 93,90)
                                                     0.0111         519132.0
MOB7(03)     MOB7(92)       0.0057 (115, 0)   0.0057 (205, 0)   0.0028 (  7,90)
                                                     0.0034          1707435
MOB7(03)     MV3(02)        0.0042 (115, 0)   0.0041 (205, 0)   0.0041 ( 24,90)
                                                   177.4801             23.78
MOB7(03)     MV3(02PRE)     0.0016 (295, 0)   0.0014 ( 25, 0)   0.0012 (126,90)
                                                   177.4441              9.20
MOB7(03)     MV3(03)        0.0057 (115, 0)   0.0057 (205, 0)   0.0056 ( 23,90)
                                                   177.4818             32.35
MOB7(03)     MV3(03PRE)     0.0016 (295, 0)   0.0014 ( 25, 0)   0.0012 (126,90)
                                                   177.4696              9.20
MOB7(03)     NGEOS          0.0013 (154,90)   0.0009 (304, 0)   0.0007 ( 34, 0)
                                                    42.7721             29.89
MOB7(03)     PIER(B)95      0.0015 (133,90)   0.0011 (300, 0)   0.0008 ( 30, 0)
                                                    74.7770             19.95
MOB7(03)     TLRS4(03)      0.0023 (158,90)   0.0013 (306, 0)   0.0011 ( 36, 0)
                                                    39.8111             58.49
MOB7(91)     MOB7(92)       0.0078 (225, 0)   0.0078 (135, 0)   0.0031 (  9,90)
                                                     0.0112         698060.2
```

GGAO SITE SURVEY 2000-2003

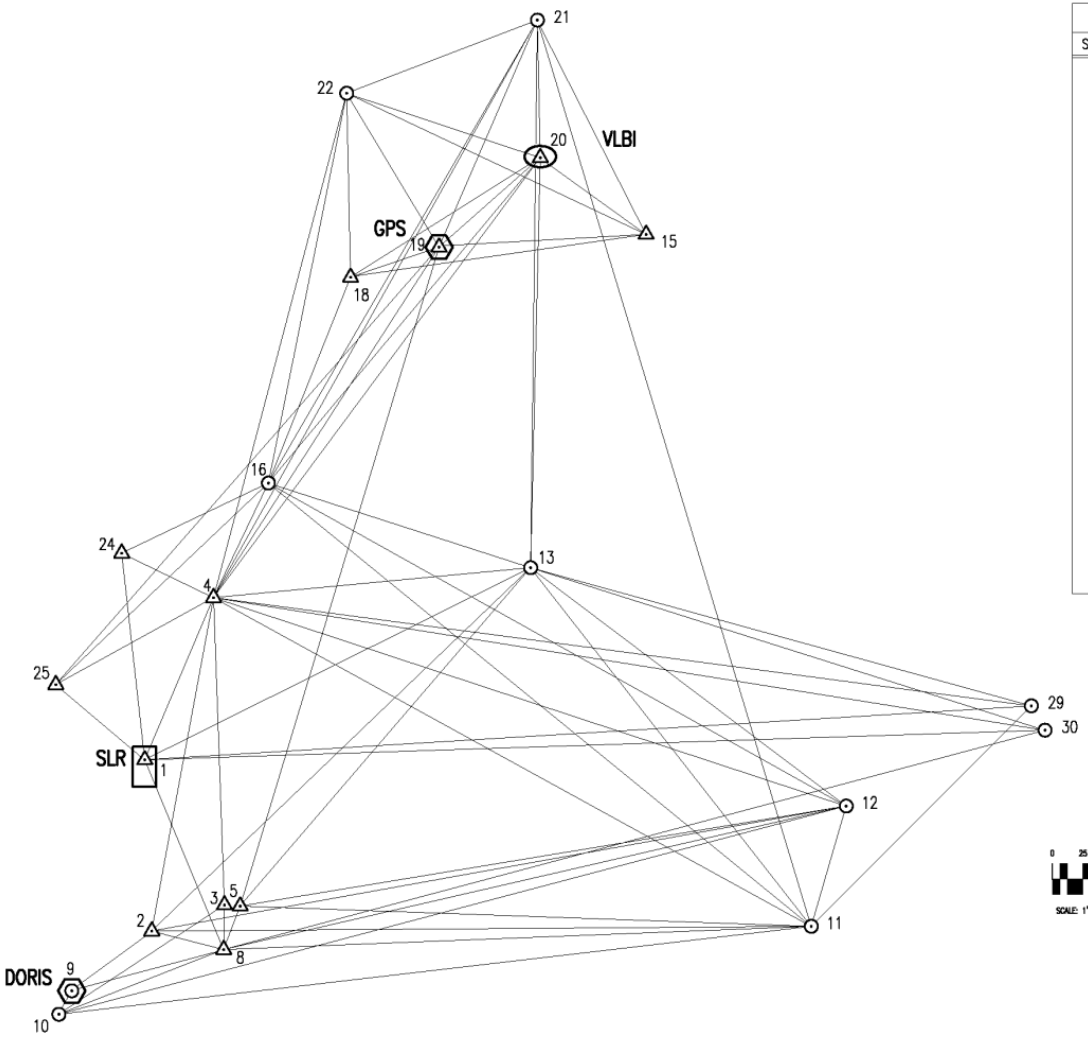
GeoLab V3.72 GRS 80 UNITS: m,DMS Page 0078

3D Relative Confidence Regions (95.000 percent):

FROM	TO	MAJ-SEMI(AZ,VANG)	MED-SEMI(AZ,VANG) DISTANCE	MIN-SEMI(AZ,VANG) PPM
MOB7(91)	MV3(02)	0.0067 (225, 0)	0.0067 (135, 0) 177.4826	0.0043 (25,90) 37.99
MOB7(91)	MV3(02PRE)	0.0055 (225, 0)	0.0055 (315, 0) 177.4466	0.0018 (90,90) 31.02
MOB7(91)	MV3(03)	0.0078 (225, 0)	0.0078 (135, 0) 177.4845	0.0058 (18,90) 43.86
MOB7(91)	MV3(03PRE)	0.0055 (225, 0)	0.0055 (315, 0) 177.4722	0.0018 (90,90) 31.02
MOB7(92)	MV3(02)	0.0067 (225, 0)	0.0067 (135, 0) 177.4811	0.0046 (13,90) 37.99
MOB7(92)	MV3(02PRE)	0.0055 (225, 0)	0.0055 (135, 0) 177.4451	0.0025 (6,90) 31.02
MOB7(92)	MV3(03)	0.0078 (225, 0)	0.0078 (135, 0) 177.4828	0.0060 (13,90) 43.86
MOB7(92)	MV3(03PRE)	0.0055 (225, 0)	0.0055 (135, 0) 177.4706	0.0025 (6,90) 31.02
MV3(02)	MV3(02PRE)	0.0039 (274, 3)	0.0039 (6,45) 0.0441	0.0039 (181,45) 88258.75
MV3(02)	MV3(03)	0.0067 (10,32)	0.0067 (138,44) 1.2576	0.0067 (260,29) 5360.99
MV3(02)	MV3(03PRE)	0.0039 (274, 3)	0.0039 (6,45) 1.0309	0.0039 (181,45) 3775.91
MV3(02PRE)	MV3(03)	0.0055 (314,46)	0.0055 (138,44) 1.2830	0.0055 (46, 2) 4290.59
MV3(03)	MV3(03PRE)	0.0055 (314,46)	0.0055 (138,44) 0.2271	0.0055 (46, 2) 24242.37
MV3PED	PIER(A)95	1.5984 (276,90)	0.0012 (108, 0) 30.9090	0.0012 (18, 0) 51712.43
MV3PED	PIER(C)95	1.5984 (200,90)	0.0013 (20, 0) 49.6581	0.0012 (290, 0) 32187.67
NGEOS	PIER(A)95	0.0017 (122, 0)	0.0009 (311,90) 163.2366	0.0004 (212, 0) 10.27
NGEOS	PIER(B)95	0.0008 (347,90)	0.0005 (117, 0) 32.0303	0.0003 (207, 0) 23.98
NGEOS	PIER(C)95	0.0014 (285, 0)	0.0010 (126,90) 128.8614	0.0004 (15, 0) 10.72
NGEOS	SGEOS	0.0011 (280, 0)	0.0008 (15,90) 86.2524	0.0008 (190, 0) 12.71
NGEOS	TLRS4(03)	0.0019 (179,90)	0.0010 (324, 0) 6.4266	0.0009 (54, 0) 302.84
PIER(A)95	PIER(B)95	0.0014 (123, 0)	0.0010 (308,90) 131.3878	0.0004 (213, 0) 10.77
PIER(A)95	PIER(C)95	0.0007 (163,90)	0.0007 (343, 0) 53.4160	0.0005 (73, 0) 13.85
PIER(B)95	PIER(C)95	0.0011 (282, 0)	0.0010 (76,90) 97.5738	0.0004 (192, 0) 11.59
PIER(B)95	SGEOS	0.0014 (283, 0)	0.0011 (81,90) 115.7175	0.0008 (193, 0) 11.71
PIER(B)95	SLR00(03)	0.0017 (284,90)	0.0016 (95, 0) 105.6830	0.0012 (185, 0) 16.41
PIER(B)95	TLRS4(03)	0.0021 (337,90)	0.0011 (125, 0) 35.5635	0.0010 (215, 0) 58.83
SGEOS	SLR00(03)	0.0014 (130,90)	0.0012 (23, 0) 10.6955	0.0011 (293, 0) 134.77

15:32:17, Tue Nov 25, 2008

Appendix H. GGAO Survey Control Network



SURVEY CONTROL MONUMENT IDENTIFICATION				
STA.	NASA HAVAGO ADJUST ID	DOME #	PID #	REMARKS
1	CDP STATION 7105	40451M105		THIS SURVEY MONUMENT OCCUPIED BY NASA MOBLAS 7 SATELLITE LASER RANGING SYSTEM
2	GORF 1989		JV6501	
3	NG2000 (NOV. 2007)			NASA SATELLITE LASER RANGING SYSTEM
4	NORTH GEOS PIER 1979		JV5895	
5	CDP STATION 7125	40451M114		NG2000 REFERENCE MONUMENT
6	NORTH GEOS RM1 1982			
7	NORTH GEOS RM2 1982			
8	SOUTH GEOS PIER 1976		JV5894	
9	DORIS ANTENNA (2007)	40451S176		DORIS ANTENNA ON PILLAR
10	CAL-PIER D			
11	CAL-PIER C			LASER SYSTEMS PRIMARY CALIBRATION PIER
12	CAL-PIER B3 (2002)			LASER SYSTEMS SECONDARY CALIBRATION PIER
13	CAL-PIER A			LASER SYSTEMS SECONDARY CALIBRATION PIER
14	GEOS AZIMUTH 1982			
15	7108 RM1			
16	GGAO VLBI RM PIER B			
17	BM WSSG TS 20428 PG			
18	JPL 4005 (GGAO GPS WEST)			
19	JPL 4006 (GGAO GPS EAST)	40451M123	AA3496	THIS SURVEY MONUMENT OCCUPIED WITG GPS ANTENNA
20	SGP 7108-1993	40451M125		THIS SURVEY MONUMENT OCCUPIED WITH NASA MV3 VLBI ANTENNA
21	GGAO VLBI RM PIER A		AH5618	
22	GGAO VLBI RM PIER C		AH5617	
23	48" TEL. REF. PT. (CDP 7106)			TELESCOPE INSIDE DOME
24	GODDARD 2		JV5873	
25	GODDARD 1962		JV5872	
26	CDP STATION 7918	40451M120		
27	CDP STATION 7103	40451M103		
28	CDP STATION 7102	40451M102		
29	CAL-PIER B2 (FEB. 2001)			THIS PIER NO LONGER USED DUE TO MOVEMENT
30	CAL-PIER B (ORIGINAL)			THIS PIER NO LONGER USED DUE TO MOVEMENT

LEGEND:

⊙ SURVEY CONTROL MONUMENT

△ SURVEY CONTROL MONUMENT/CONCRETE PIER