



DEPARTMENT OF THE ARMY
ENGINEER RESEARCH AND DEVELOPMENT CENTER, CORPS OF ENGINEERS
COASTAL AND HYDRAULICS LABORATORY
WATERWAYS EXPERIMENT STATION, 3909 HALLS FERRY ROAD
VICKSBURG, MISSISSIPPI 39180-6199

CEERD-HN-N

31 MAR 2009

MEMORANDUM FOR Commander, US Army Engineer District, Savannah (CESAW-TS-EC/Mr. Wilbur Wiggins), P.O. Box 889, Savannah, GA 31401-3640

SUBJECT: Savannah Harbor Simulations Study 2009

1. During 2002 and 2003, the US Army Engineer Research and Development Center (ERDC) conducted a ship simulator based navigation study for the Savannah District (SAS). In 2008, SAS contacted ERDC to revisit that study and conduct additional simulations for three different reaches (Figure 1) to evaluate proposed changes to the channel recommended in the earlier study. The following are the three reaches:
 - a. Reach 1: Long Island Range. The earlier study recommended that the Long Island Range be widened to allow for two-way traffic of the design vessel. The SAS wishes to determine if the reach needs to be widened for its entire length or if a shorter portion of the reach can safely provide a meeting area.
 - b. Reach 2: Oglethorpe Range. The study recommended widening the transition from Ft. Jackson Range to Oglethorpe Range a distance of 100 ft. This area appears too short to safely accommodate a meeting lane. Oglethorpe Range (Figure 2) is longer and centrally located to the project and is thought to have good potential as a meeting area but the required length needs to be determined from simulation
 - c. Reach 3: Marsh Island Channel to Kings Island Turning Basin. This reach (Figure 3) needs to be narrowed to accommodate additional berth width required by the design vessel for the Savannah Harbor Expansion Project. In addition, the SAS's original improvement plan widened the Kings Island Turning Basin by 100 ft. The SAS wishes to determine if the 50-ft narrowing (32 ft additional for berth width + 18 ft for deepening) adversely impacts navigation traffic and affects the approach into Kings Island Turning Basin.
2. Two simulation sessions were conducted. The first was January 14 – 16, 2009. The pilots for that session were Capt. John Ebberwein and Capt. Robert A. King. The second session was January 21 – 23, 2009 and the pilots were Capt. Rick Wesley and Capt. Robert (Trey) Thompson, III. Each pilot was given a final questionnaire at the end of the week. Those questionnaires are included as Appendix A.
3. Week 1 Simulations. The first week of simulations concentrated on evaluating the length of the passing zone required for Long Island Range. This was accomplished by starting inbound and outbound ships at various locations and telling the pilots to meet in the middle of Long Island Range. This way the necessary length could be bracketed. Based upon the results of the first week, passing zone lengths of 5,000, 6,000, and 7,000 ft were selected for the second week of testing. Meeting scenarios in the Oglethorpe Range were attempted. However, the ship-to-

CEERD-HN-N

31 MAR 2009

SUBJECT: Savannah Harbor Simulations Study 2009

ship interaction was too severe. Therefore, it was agreed to wait until the interaction could be fixed before simulating two-way traffic in Oglethorpe Range. The interaction problems were corrected prior to the second week of testing. A number of transits were conducted through the City Front Area (Marsh Island Channel and Kings Island Turning Basin). Results from those exercises will be presented in composite plots with those runs completed in the second week of testing.

4. Week 2 Simulations. Results from the second week of simulations are presented in the form of track plots in Plates 1 – 25.

a. Individual track plots for two-way traffic on Long Island Channel are shown in Plate 1 – 17. Plots for the 5,000-ft long zone are shown in Plates 1 – 3. One pilot had difficulty getting his ship back in the channel before the end of the 5,000-ft section (Plate 1). Two pilots cut the corner of the channel at the southern end of the zone to get out of the way of the outbound ship (Plates 2 and 3). Plots for the 6,000-ft zone are shown in Plates 4 – 9. With the exception of Plate 9, the pilots had difficulty timing their meeting for the 6,000-ft long section. Results from the 7,000-ft long zone are shown in Plates 10 – 17. The pilots had an easier time meeting in the 7,000-ft zone than in either the 5,000 or 6,000-ft zones. However, several of the runs meet at the extreme northern end of the zone (Plates 10, 14, 15, and 16).

b. Individual track plots for two-way traffic in Oglethorpe Range are shown in Plates 18 – 21. These plots are for two Susan Maersk ships meeting each other. These runs were successful and required the entire length of Oglethorpe Range.

c. Composite plots of the city front area (Marsh Island Channel and Kings Island Turning Basin) are shown in Plate 22 – 25. All runs were successful and the ships did not have a problem with the 50 ft narrowing.

5. Recommendations. The 7,000-ft long meeting zone on Long Island Channel was more successful than either the 5,000 or 6,000-ft long zones. However, the pilots still had some difficulties meeting in the 7,000 ft length. Therefore, a length of 8,000 ft is recommended for the zone. The 100-ft widening of Oglethorpe Range was adequate for two-way traffic of the Susan Maersk. The 50-ft narrowing of Marsh Island Range did not adversely affect traffic.

Encls



WILLIAM D. MARTIN, PhD, PE
Director

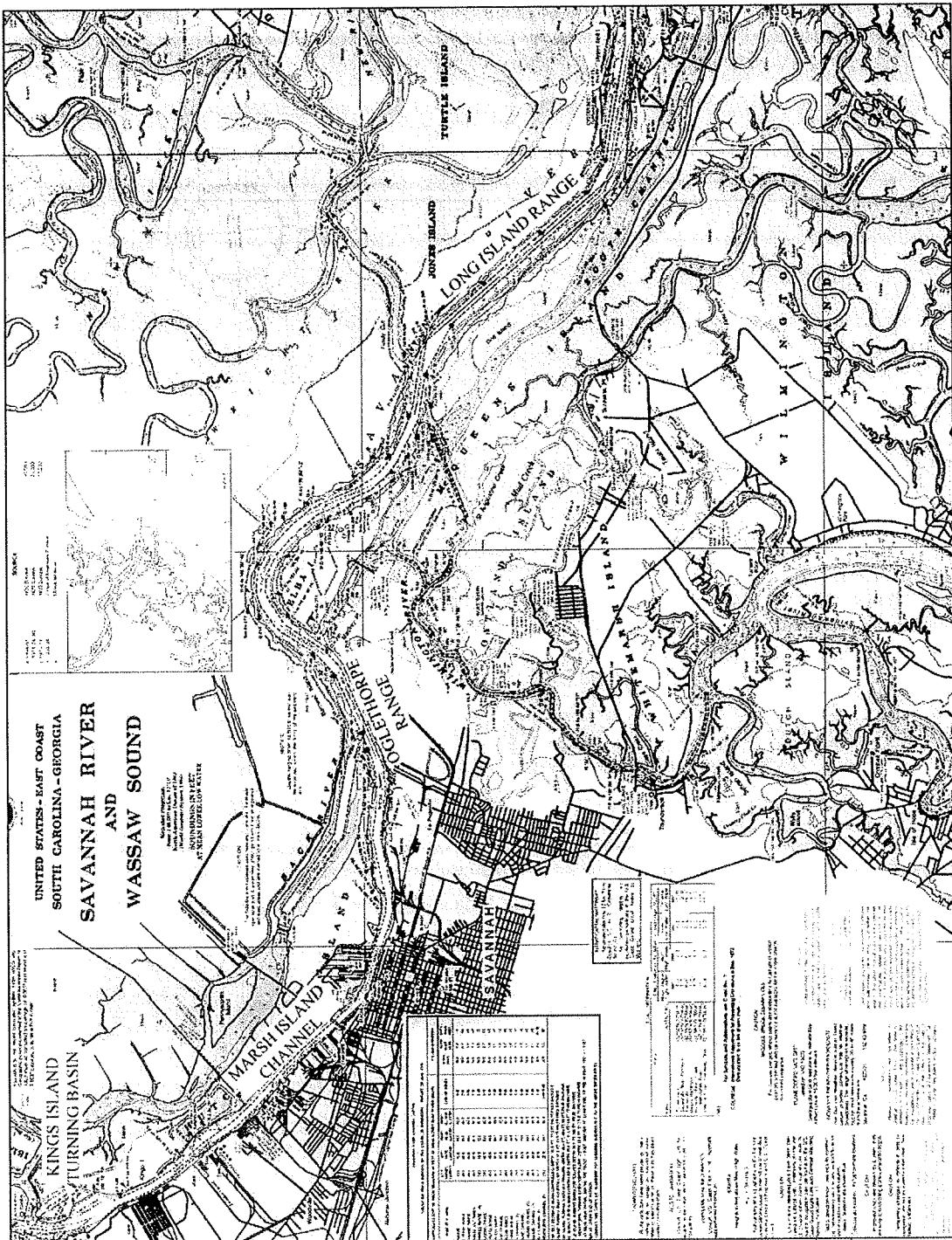


Figure 1. Savannah River

Sampling areas of interest in this study

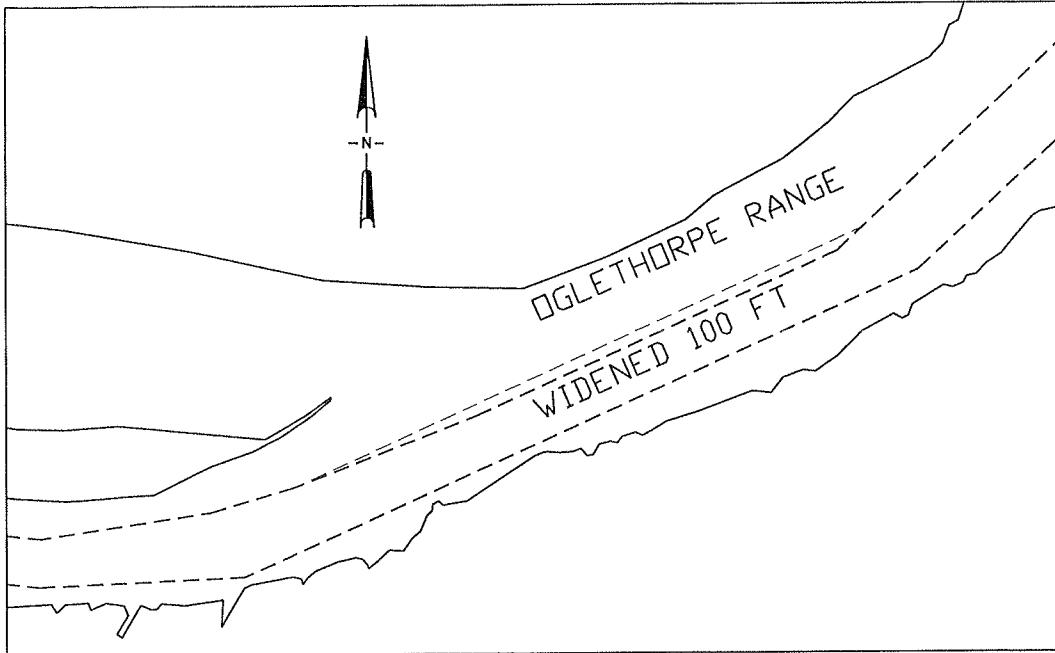


Figure 2. Oglethorpe Range

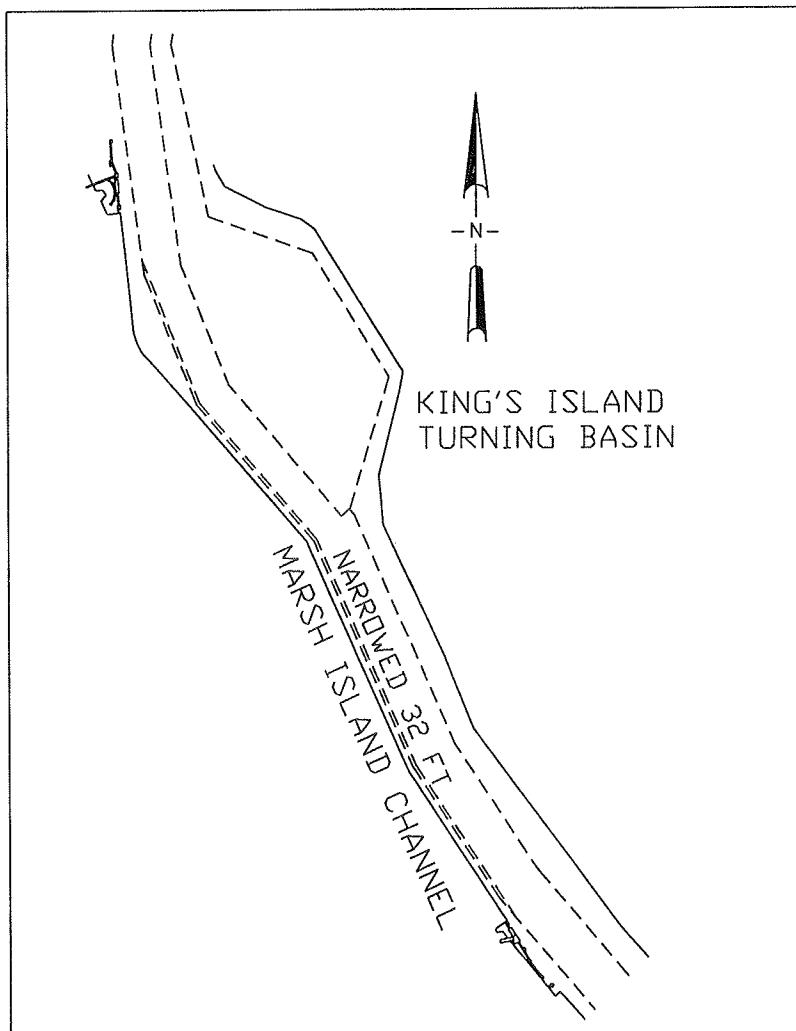
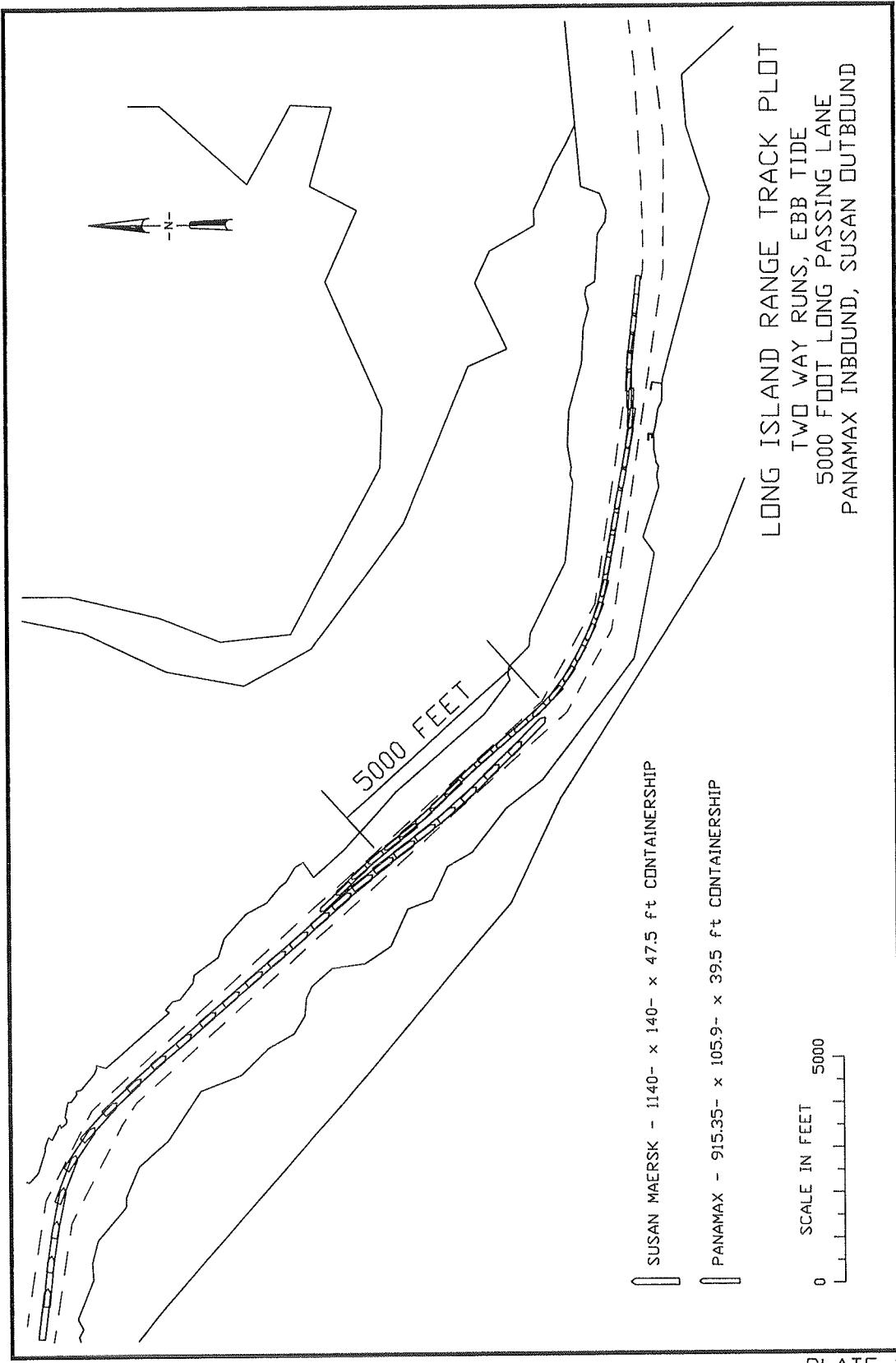
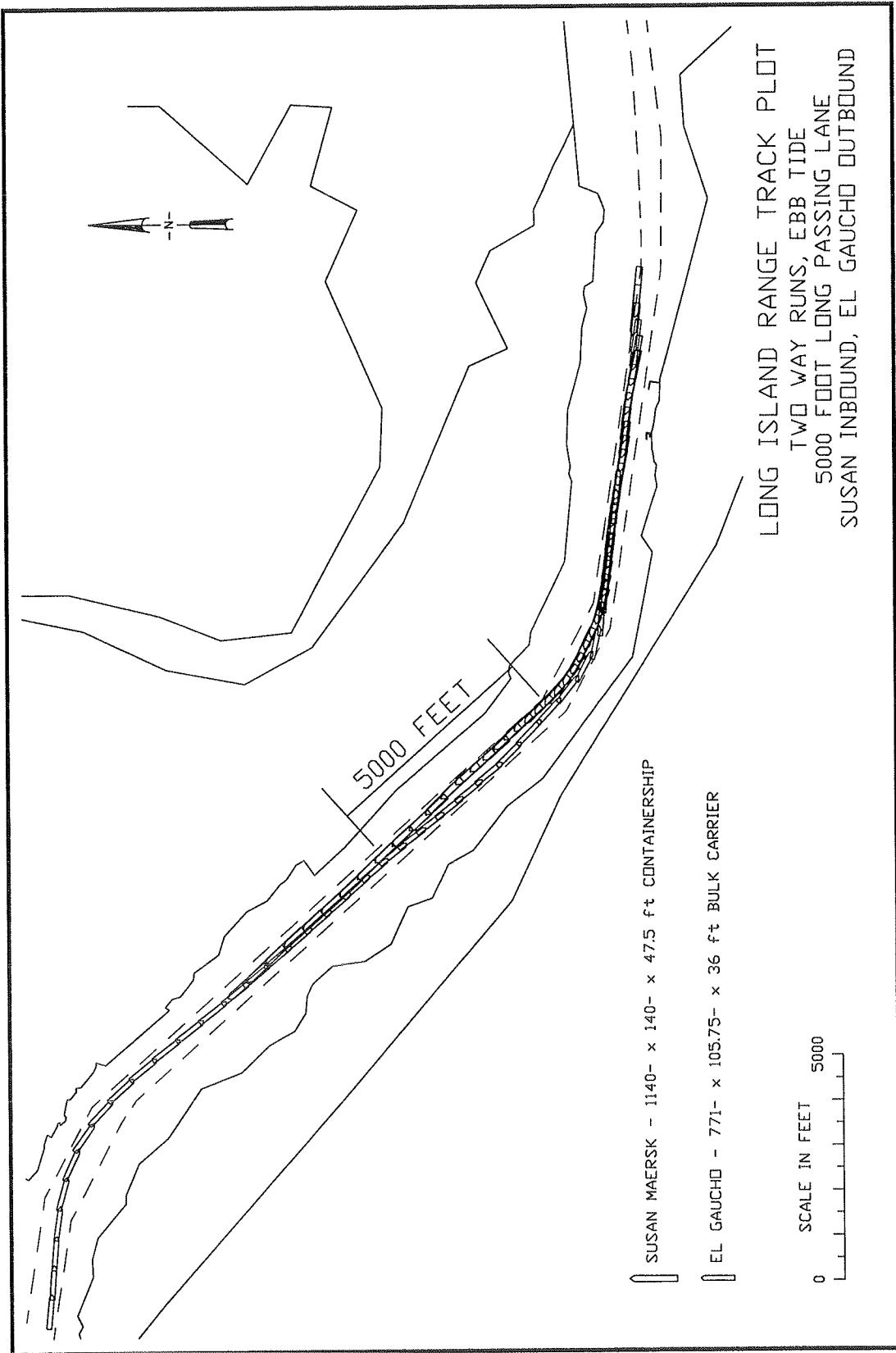
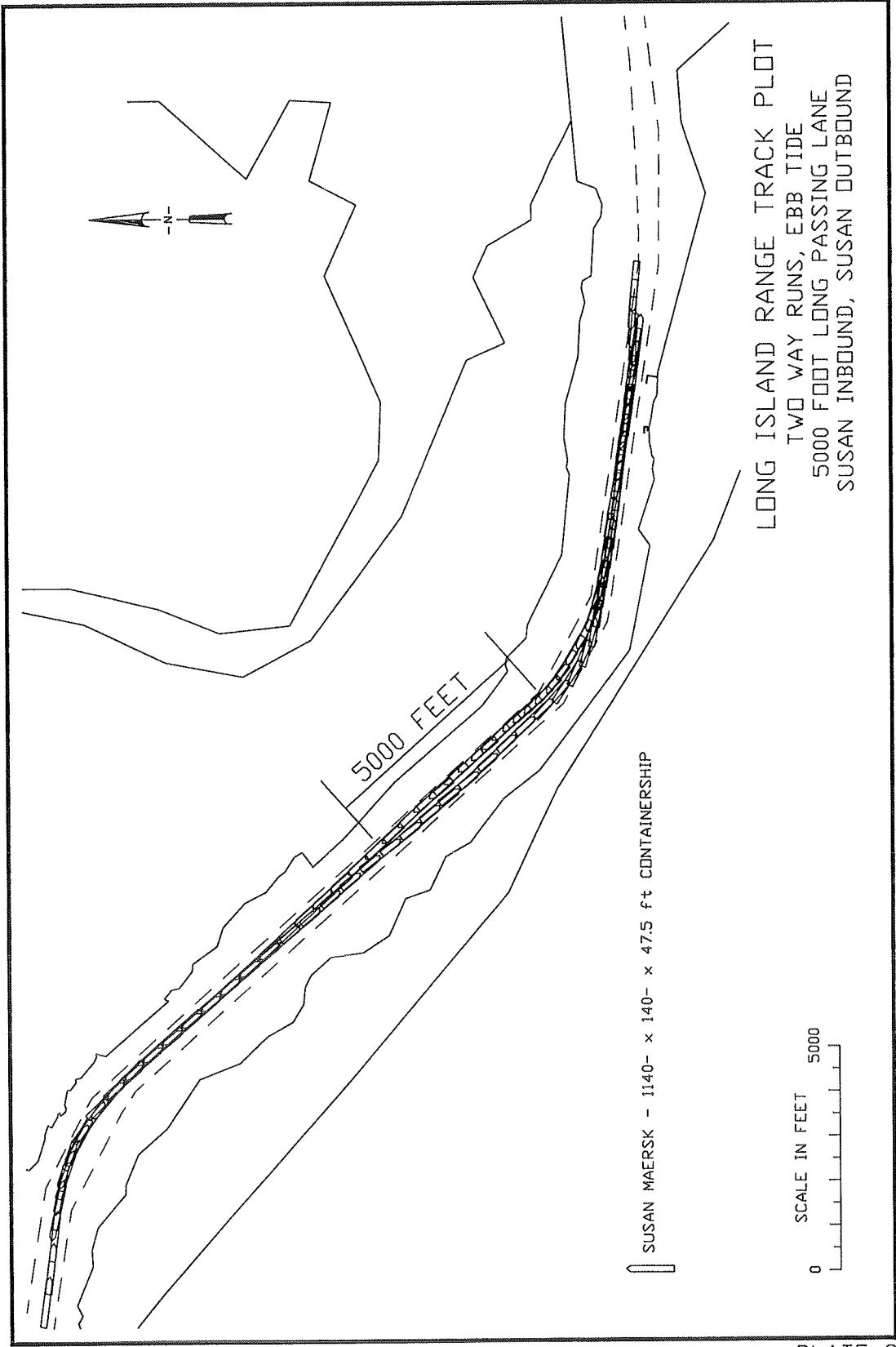
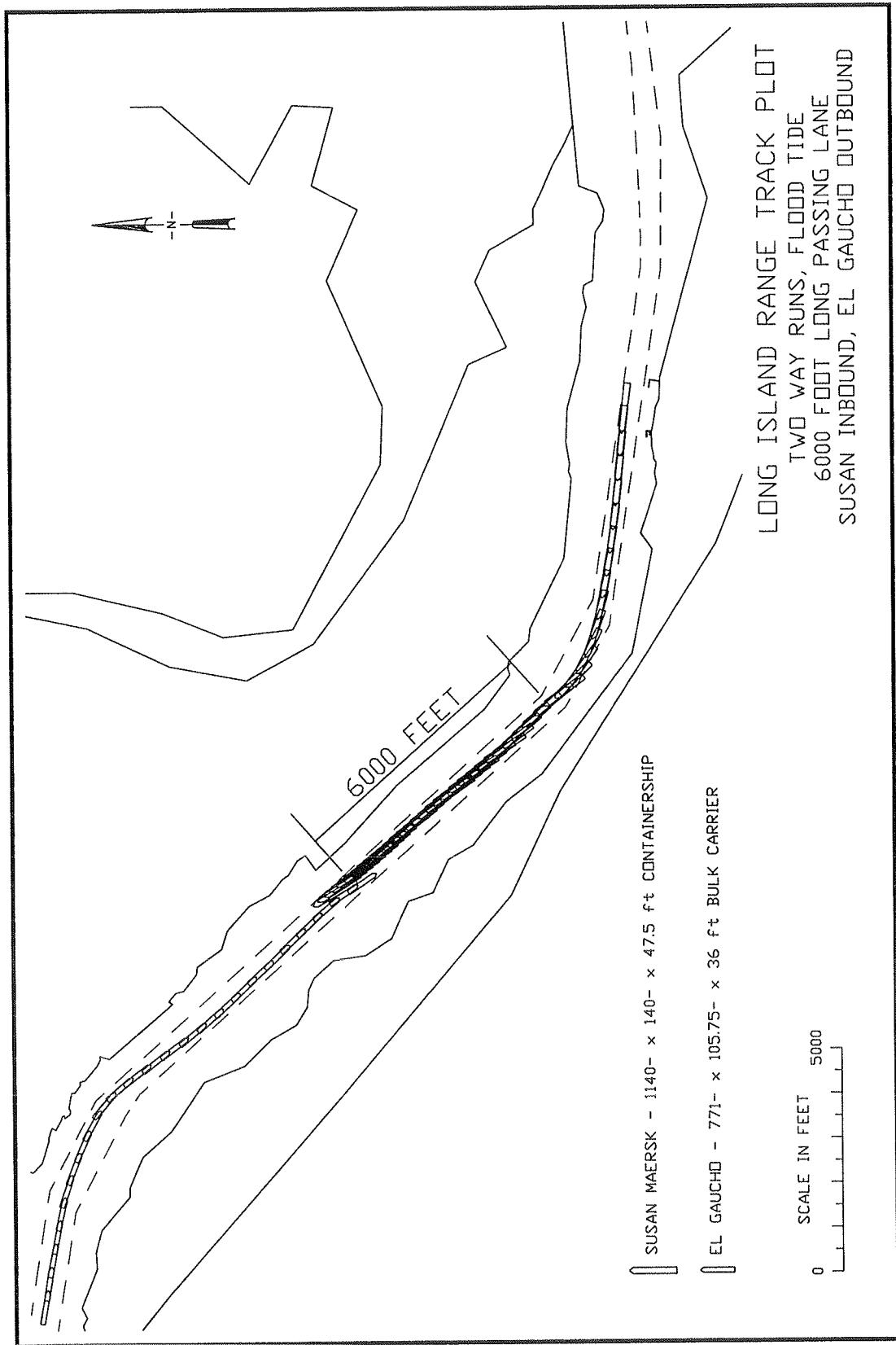


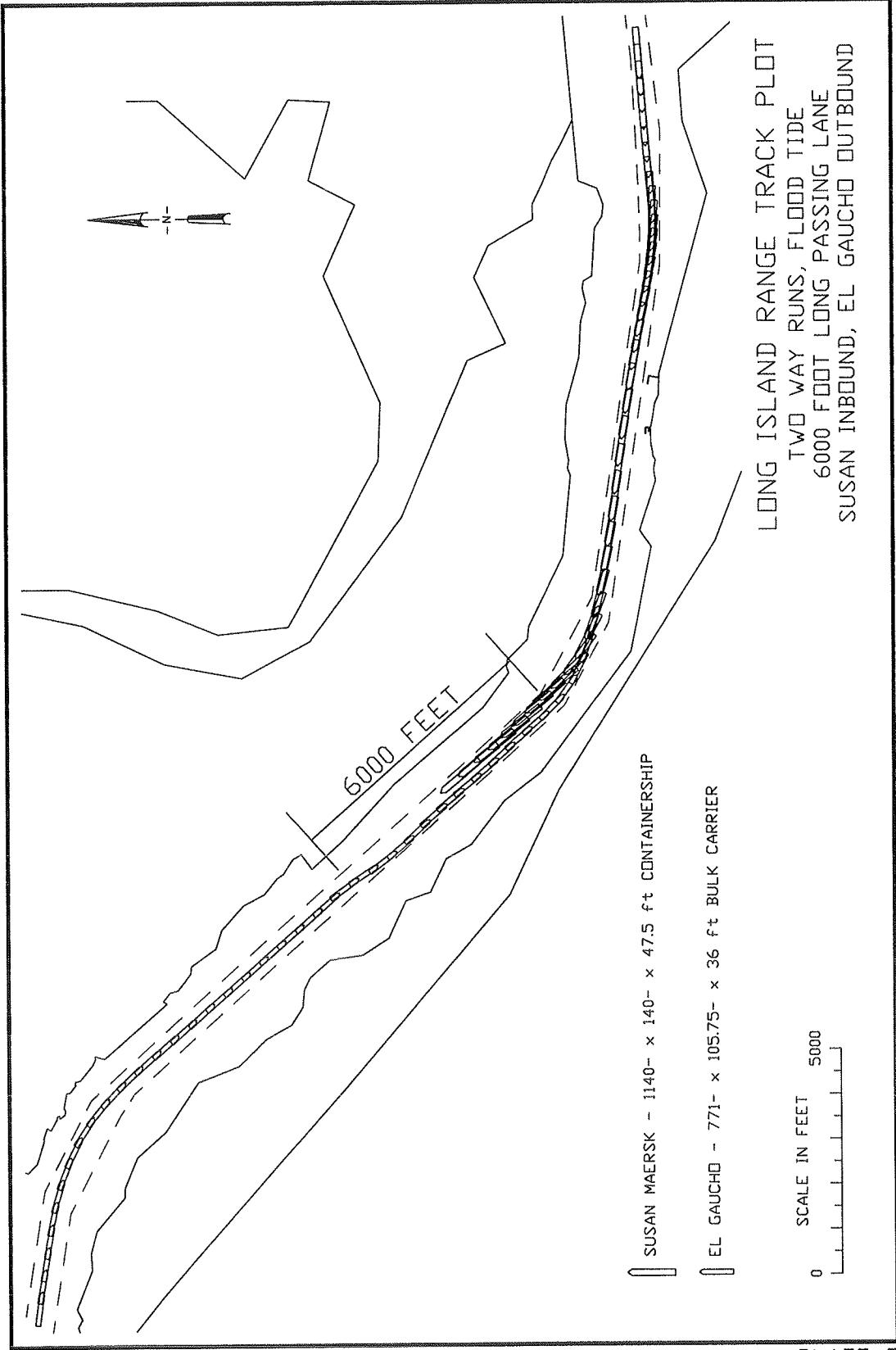
Figure 3. Marsh Island Channel

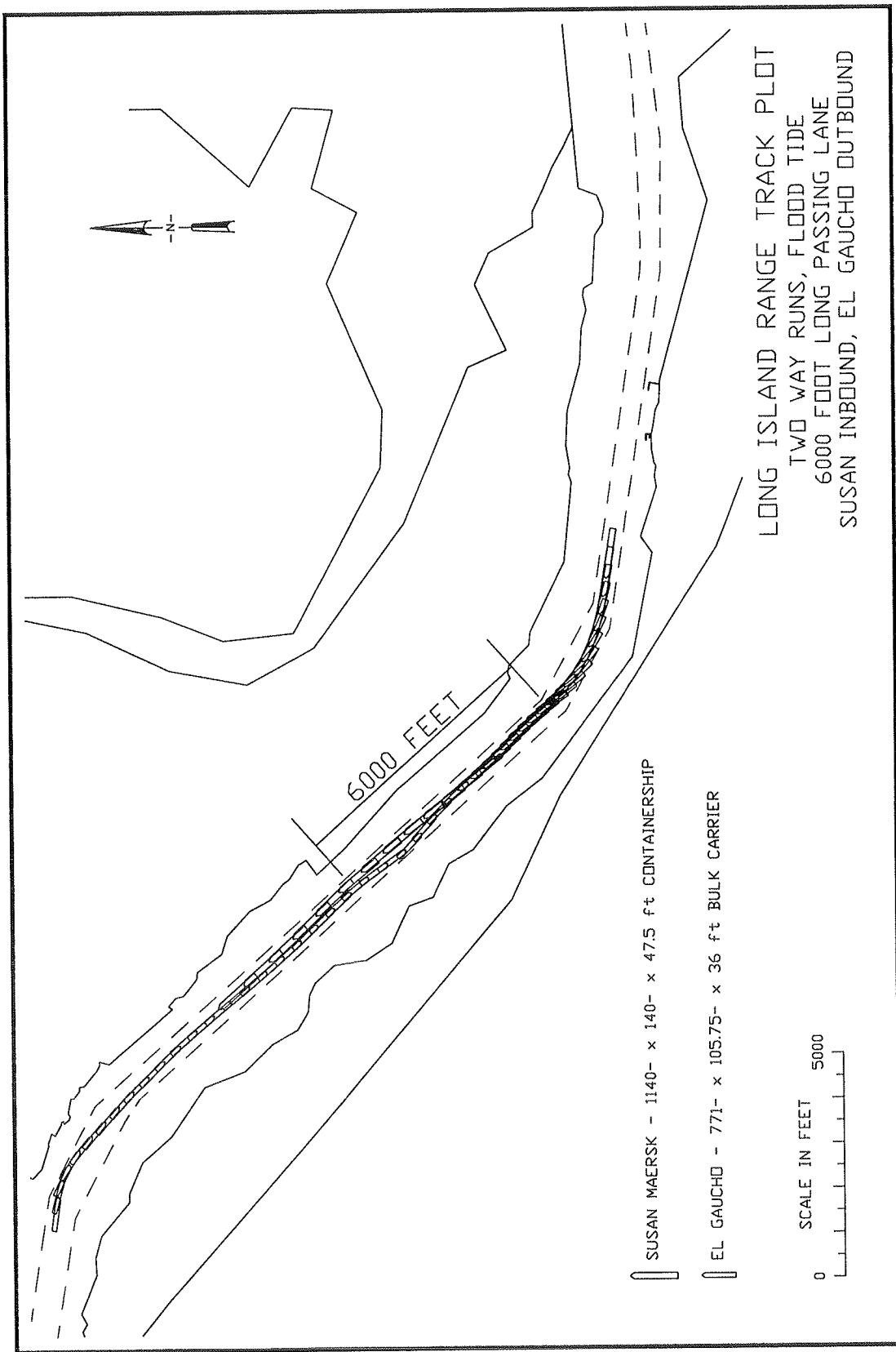


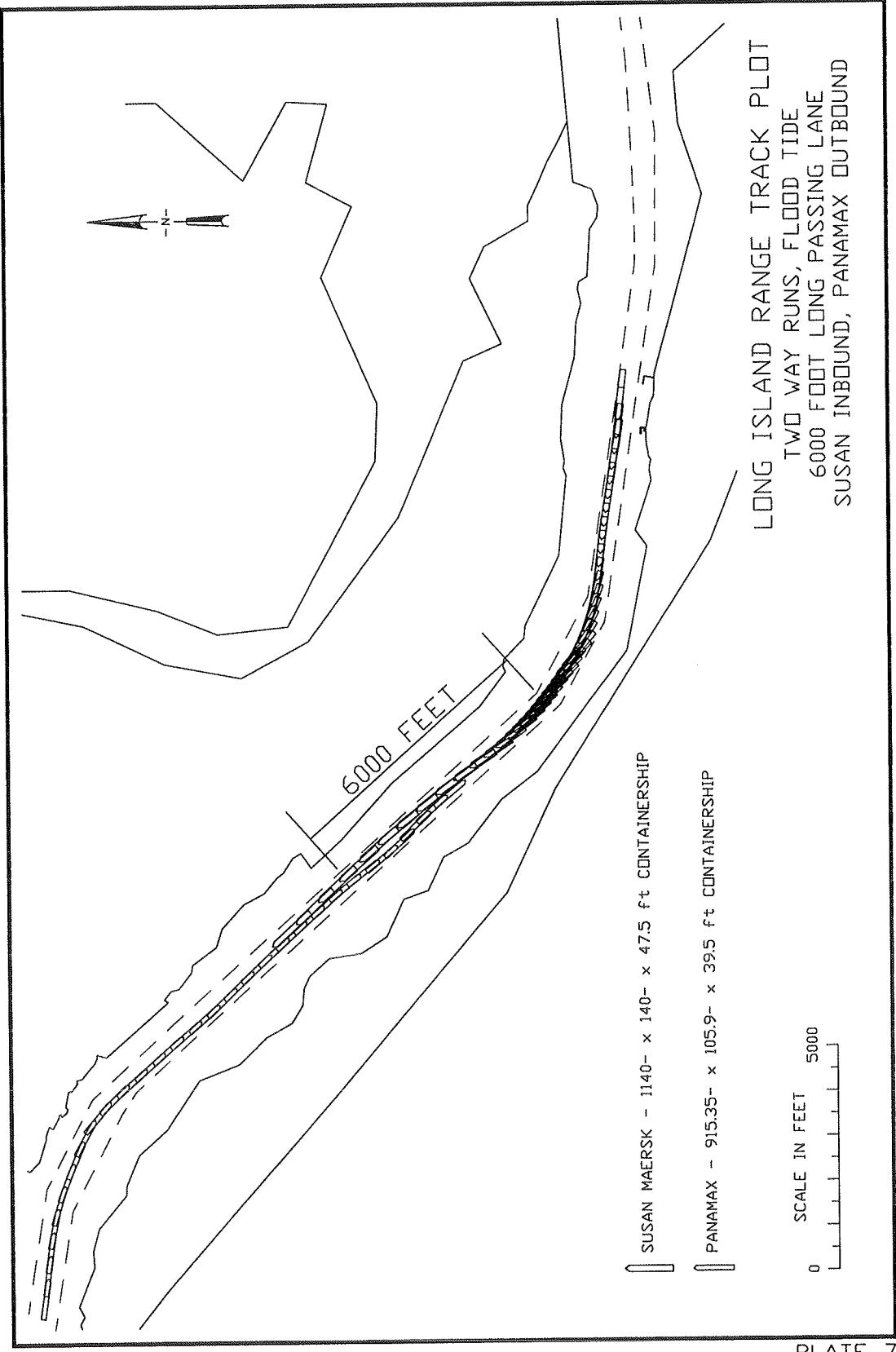


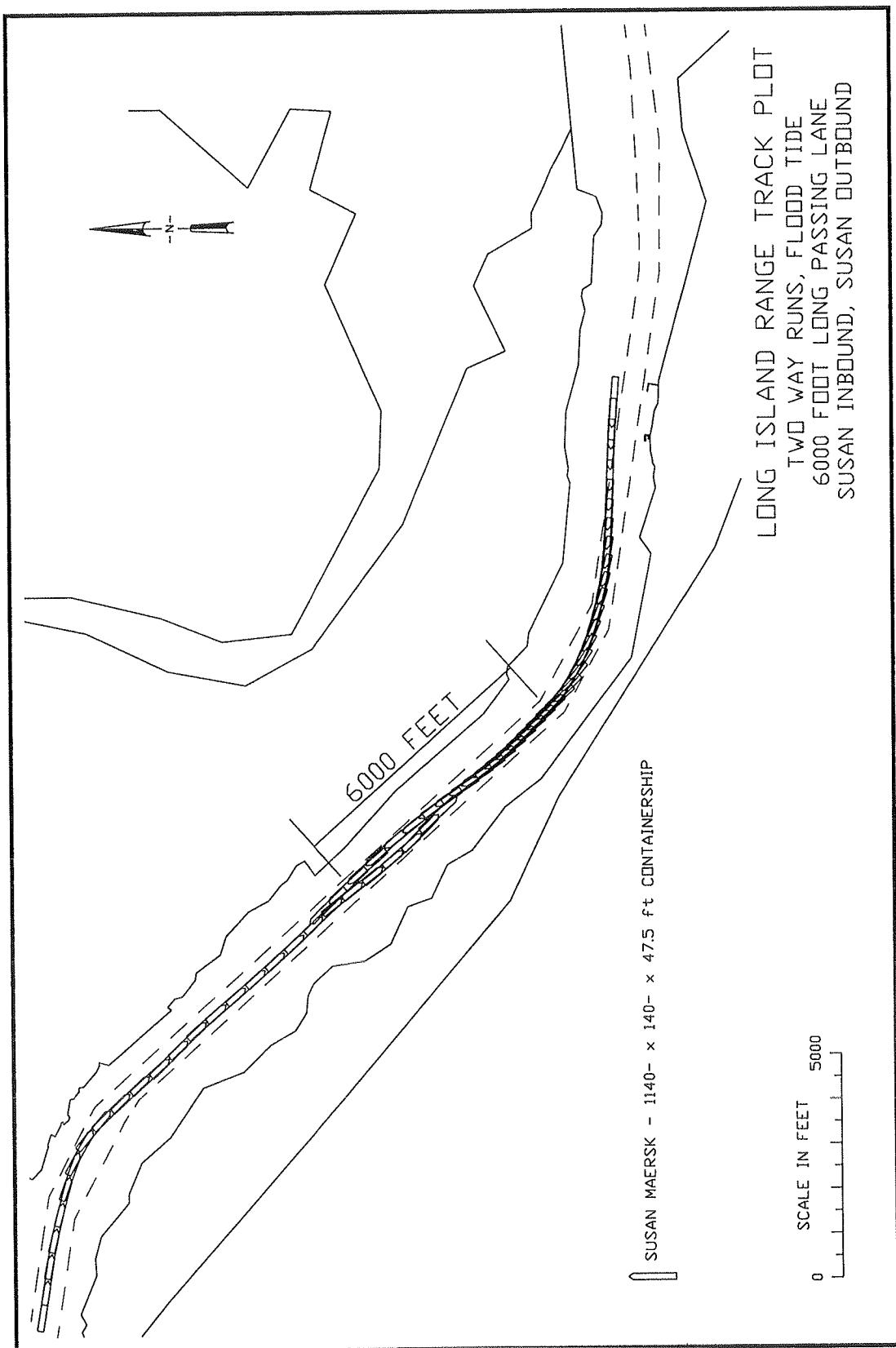


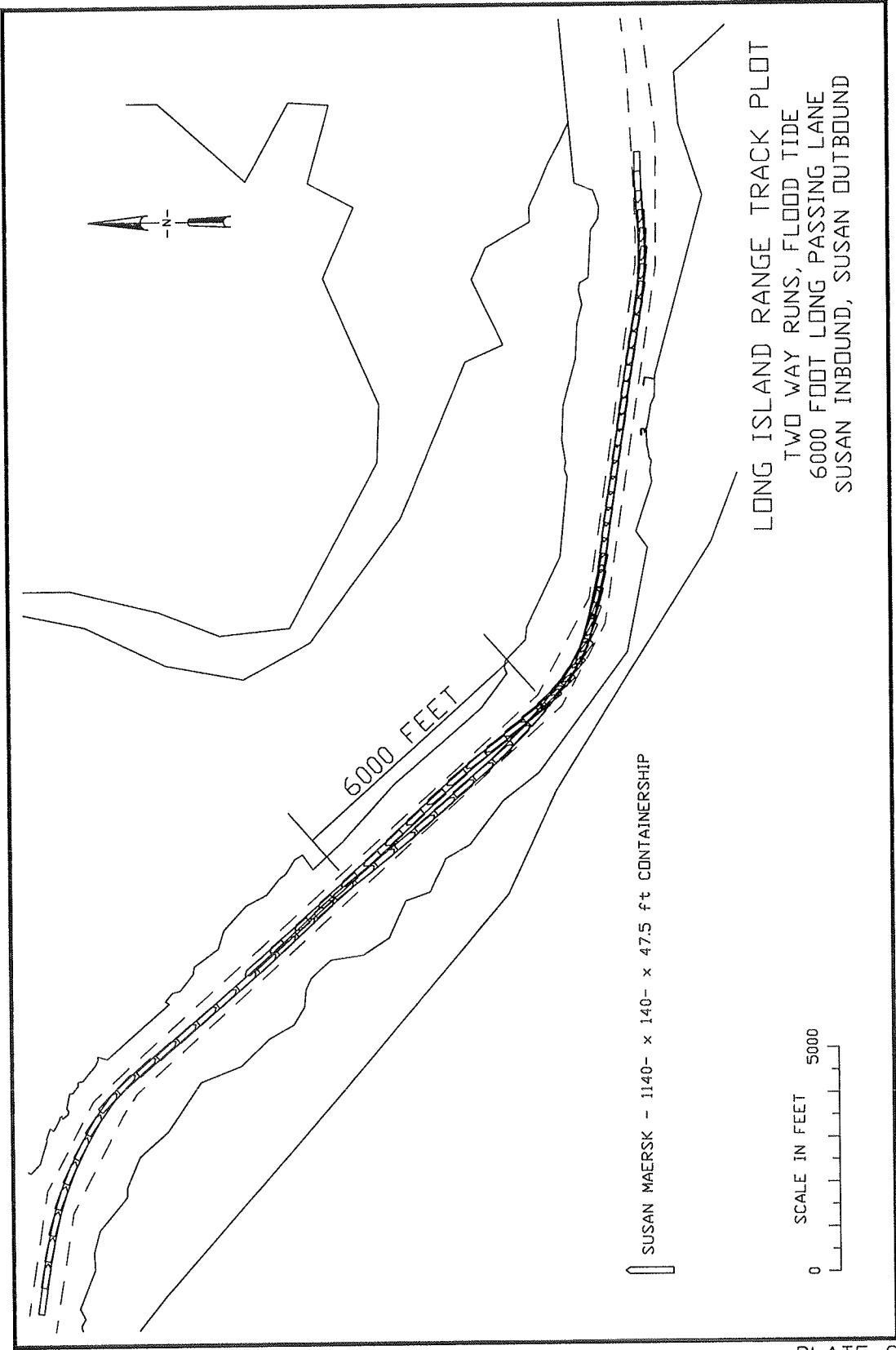


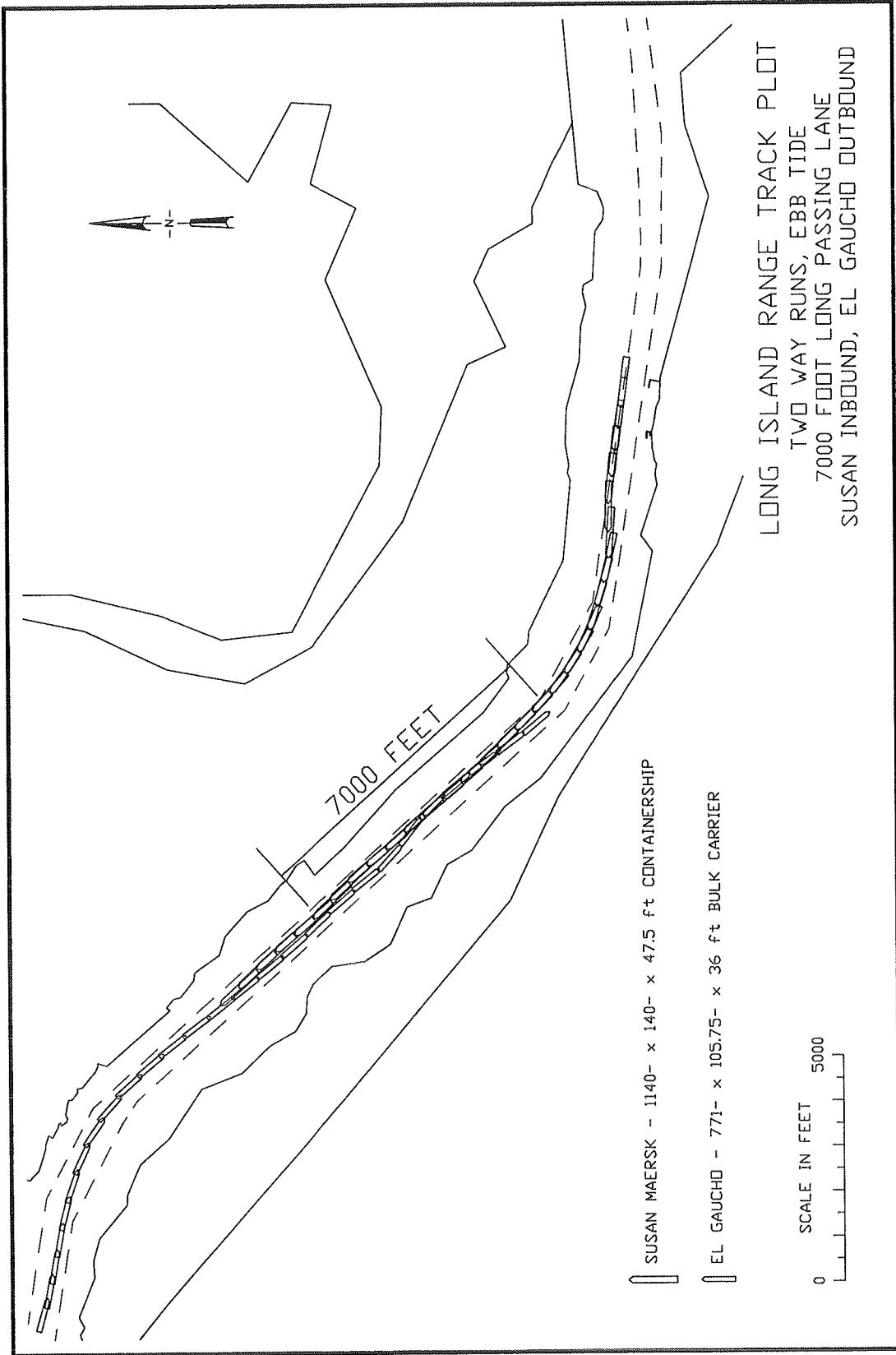


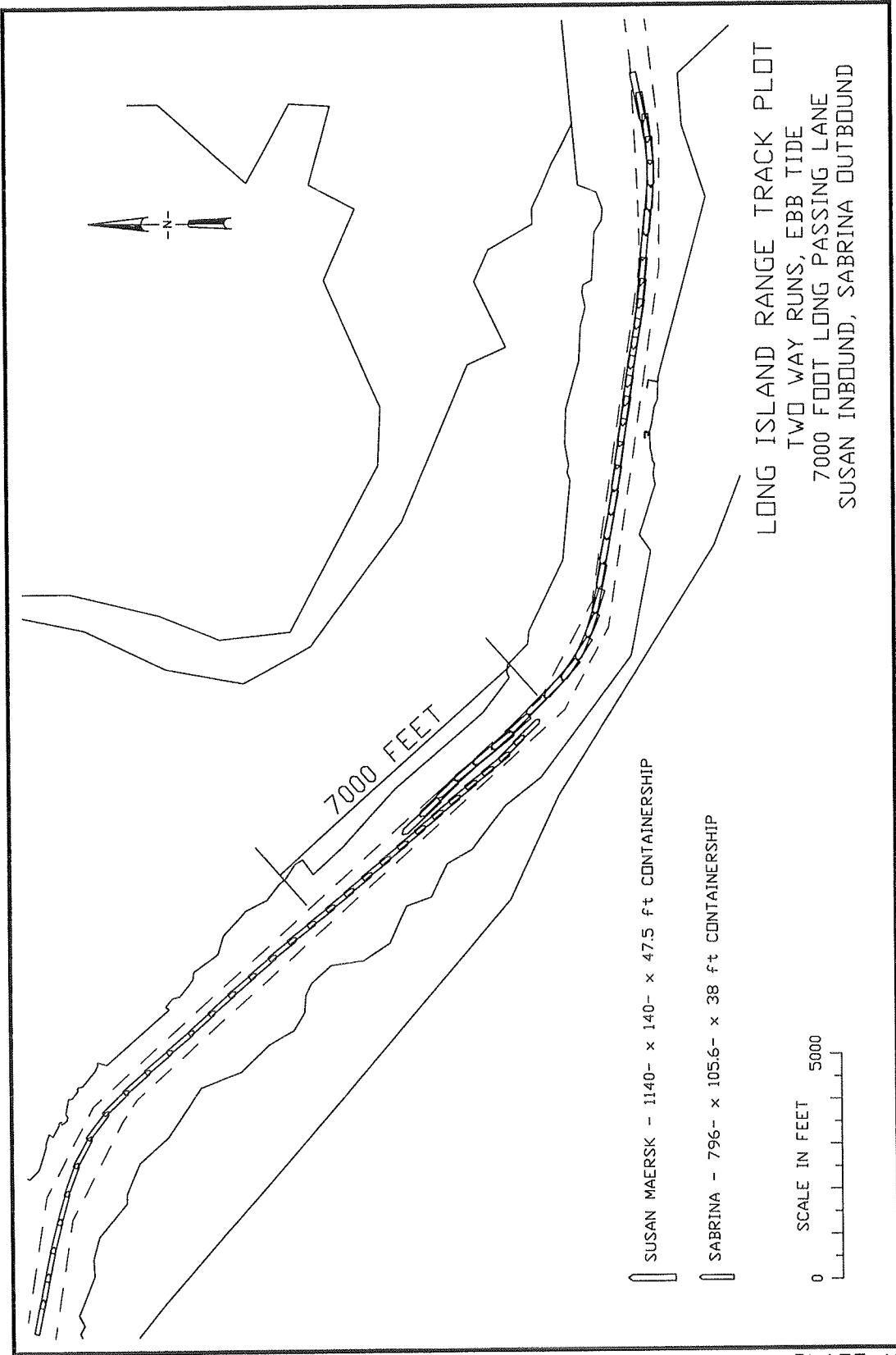












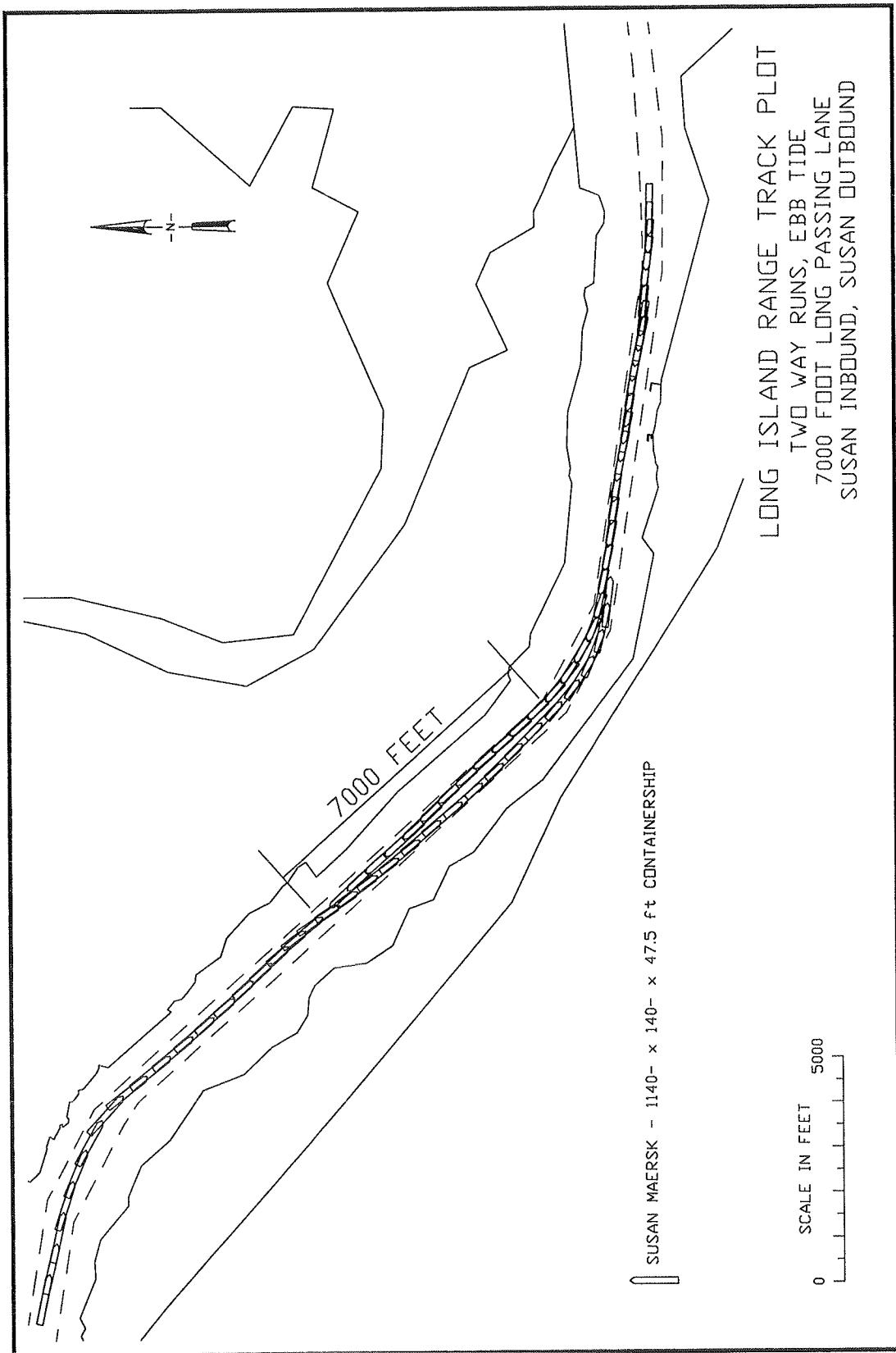


PLATE 12

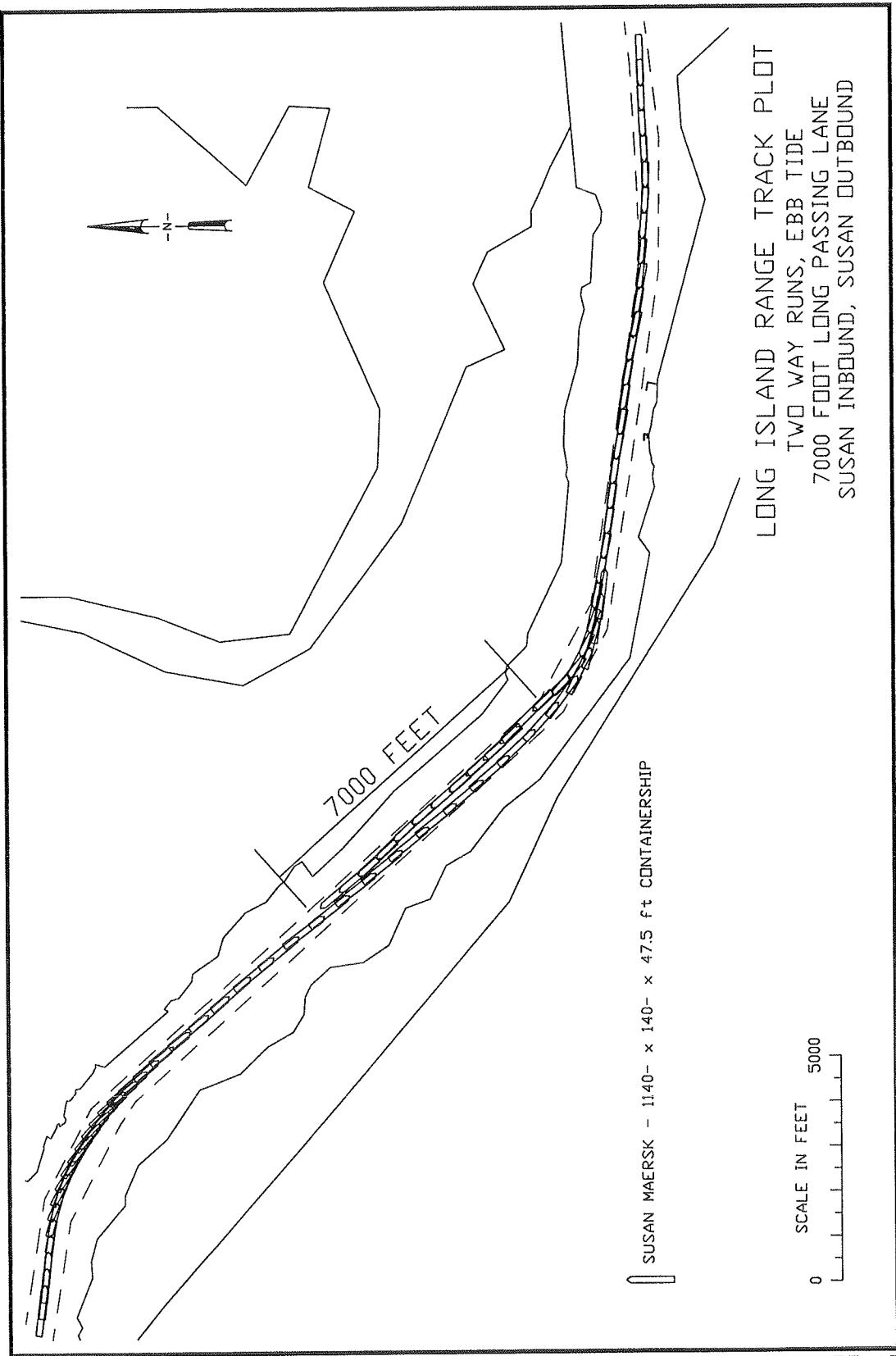
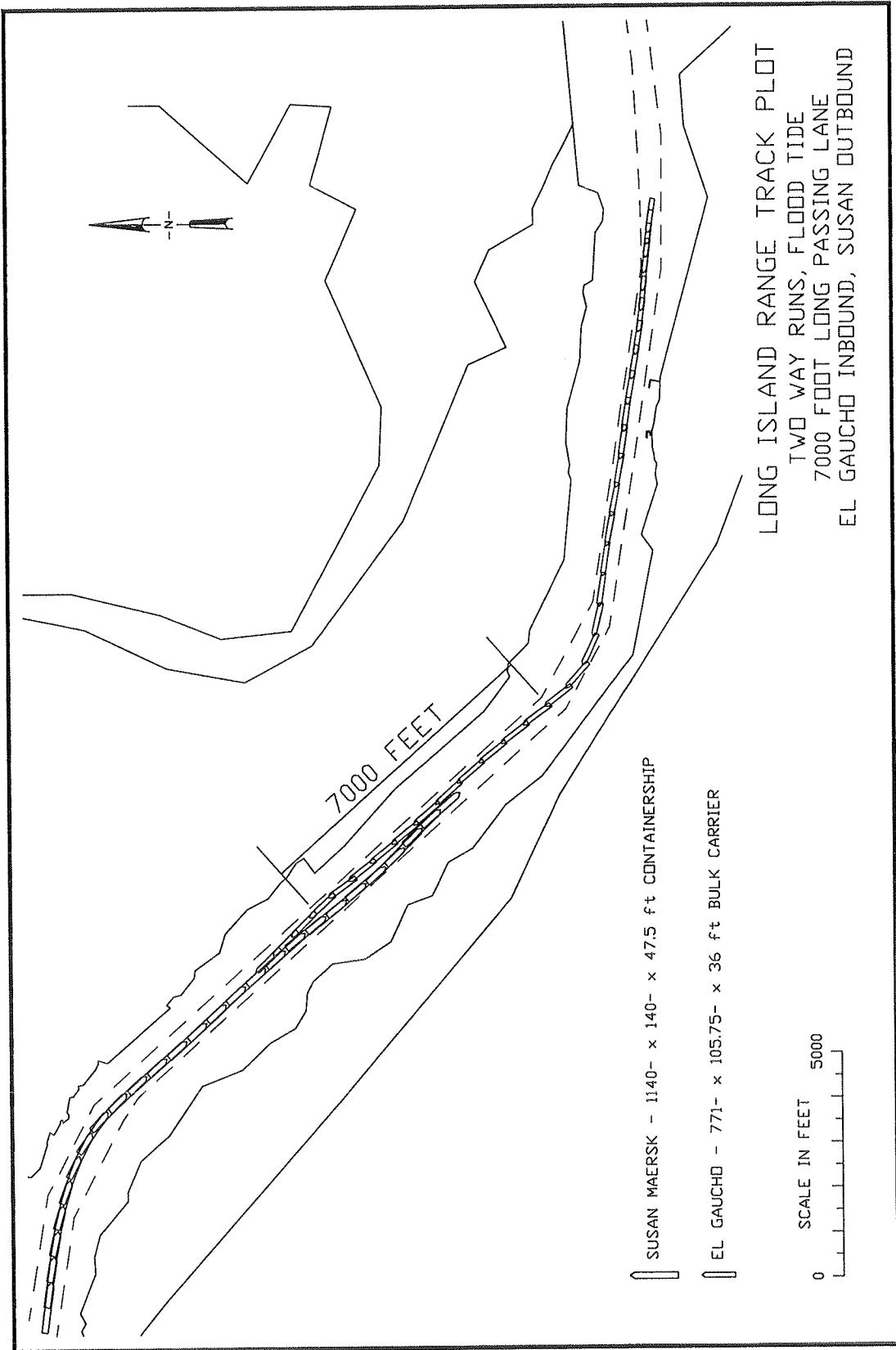
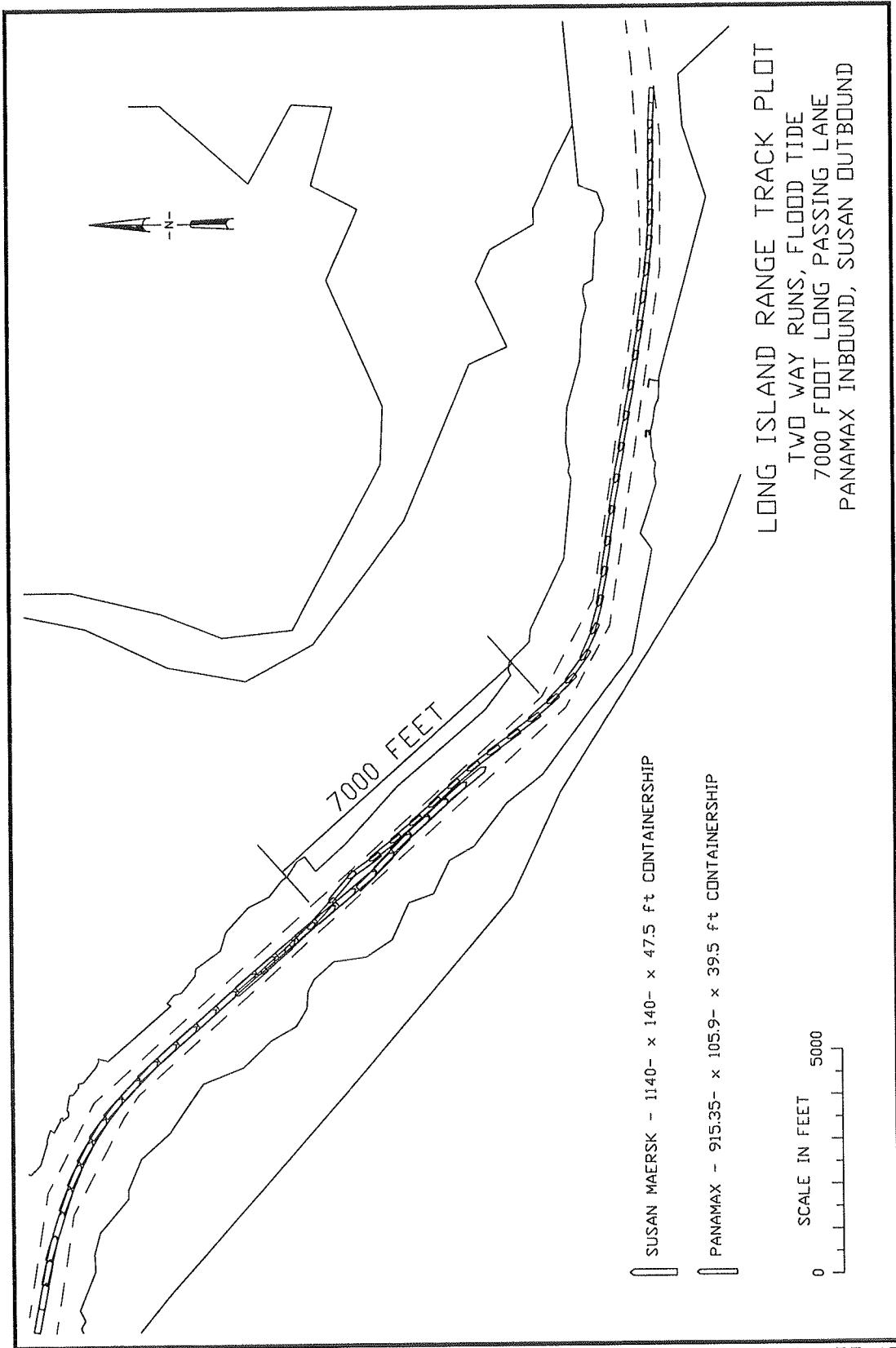
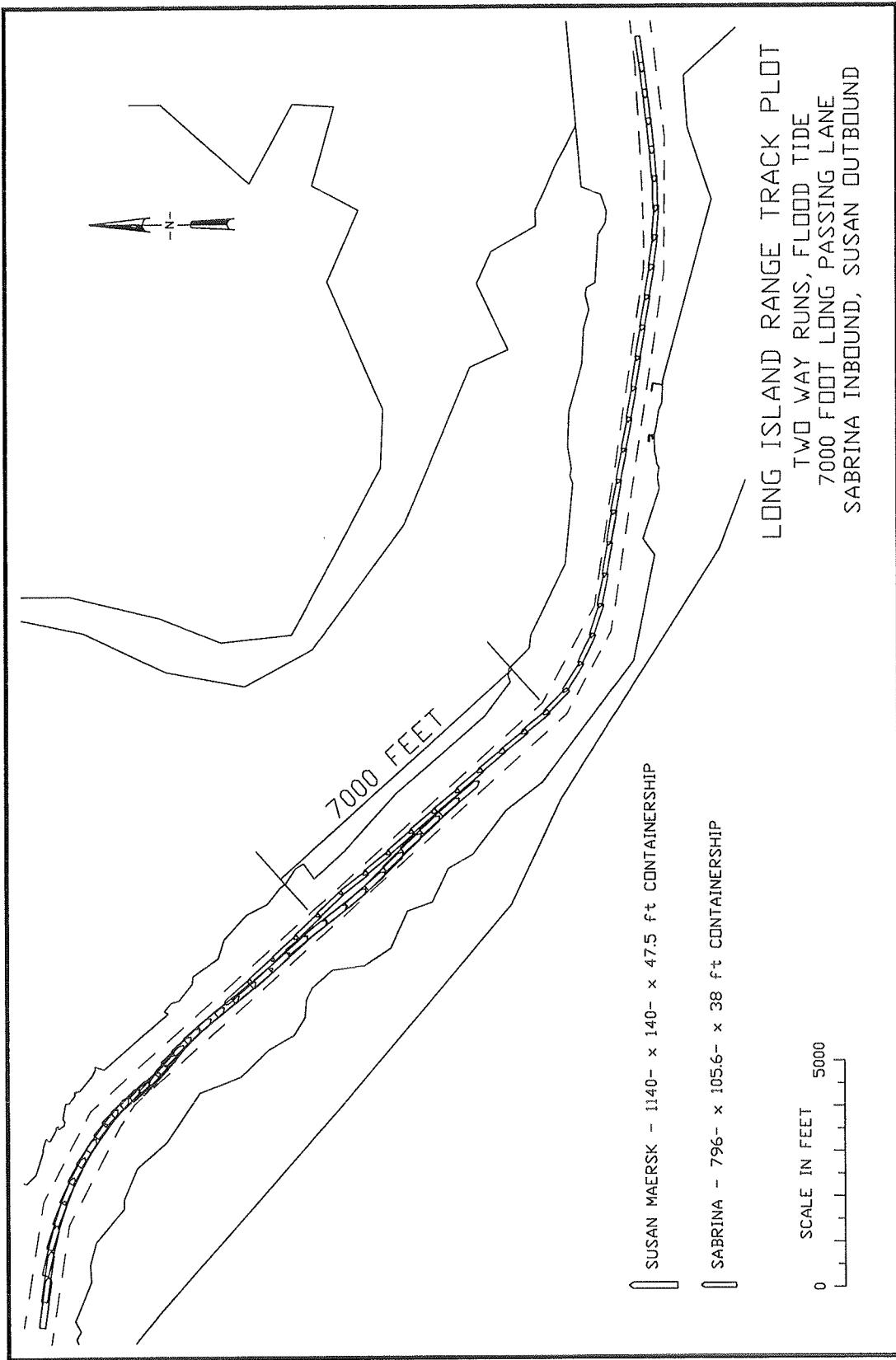
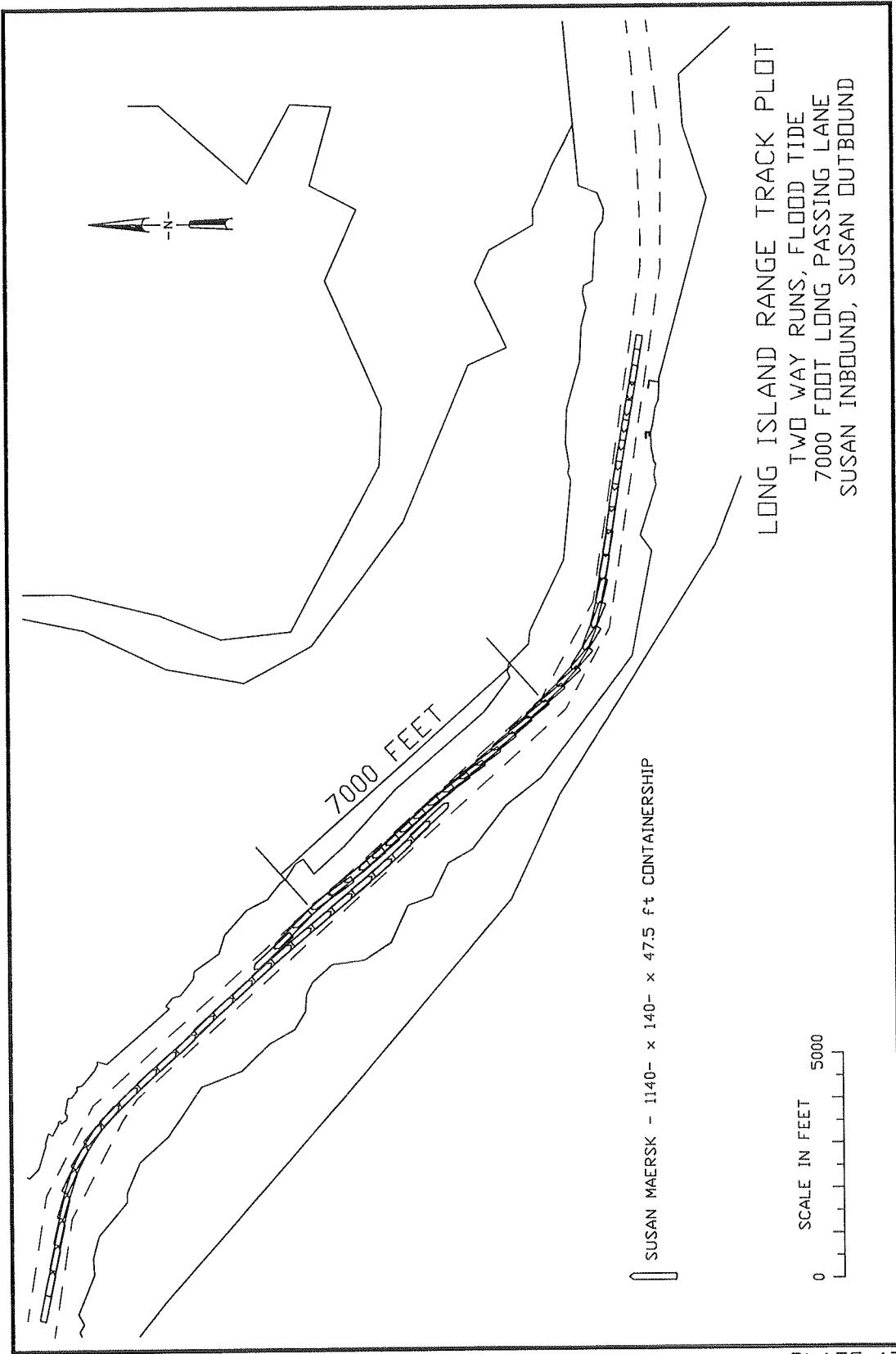


PLATE 13









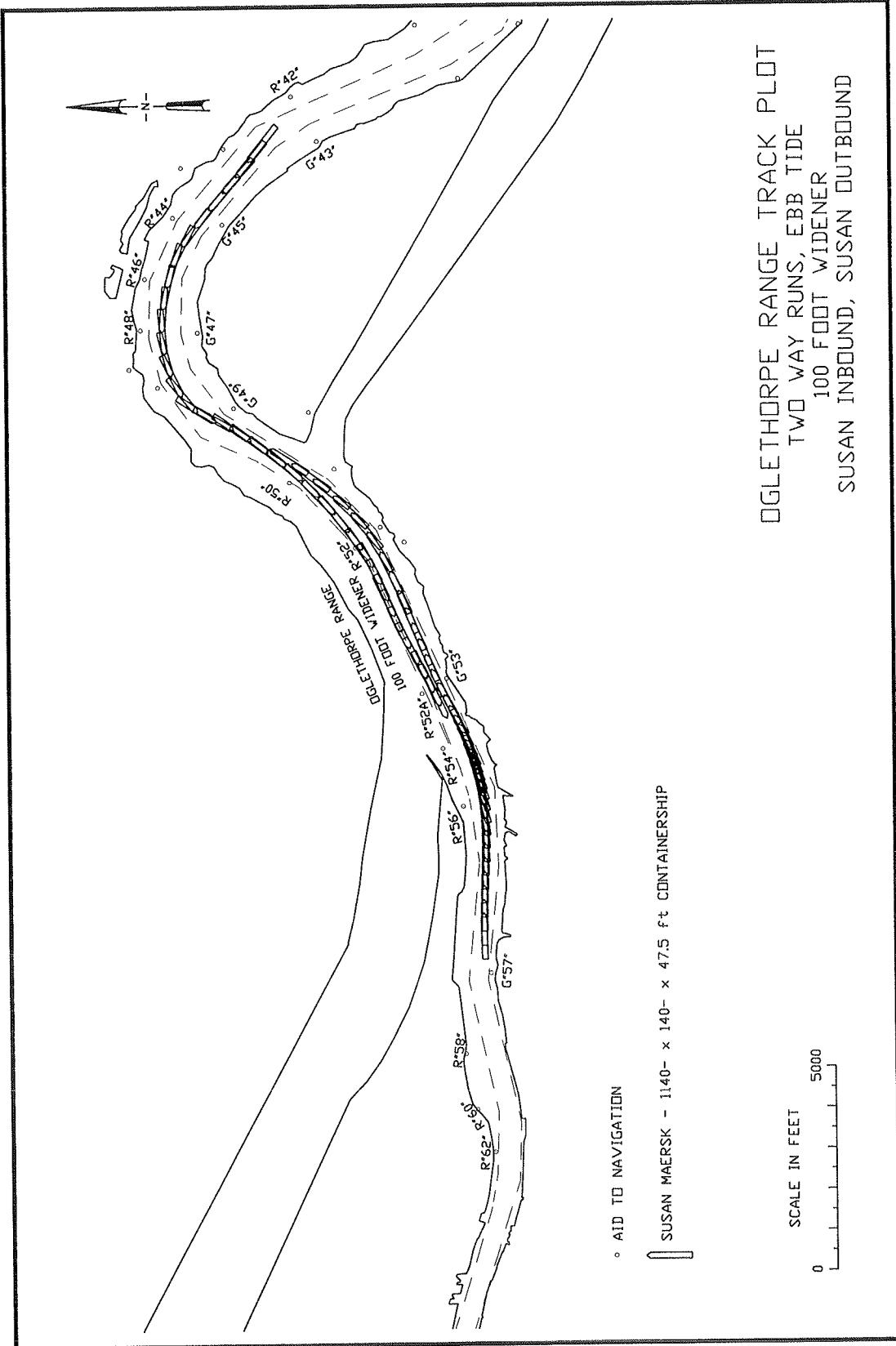
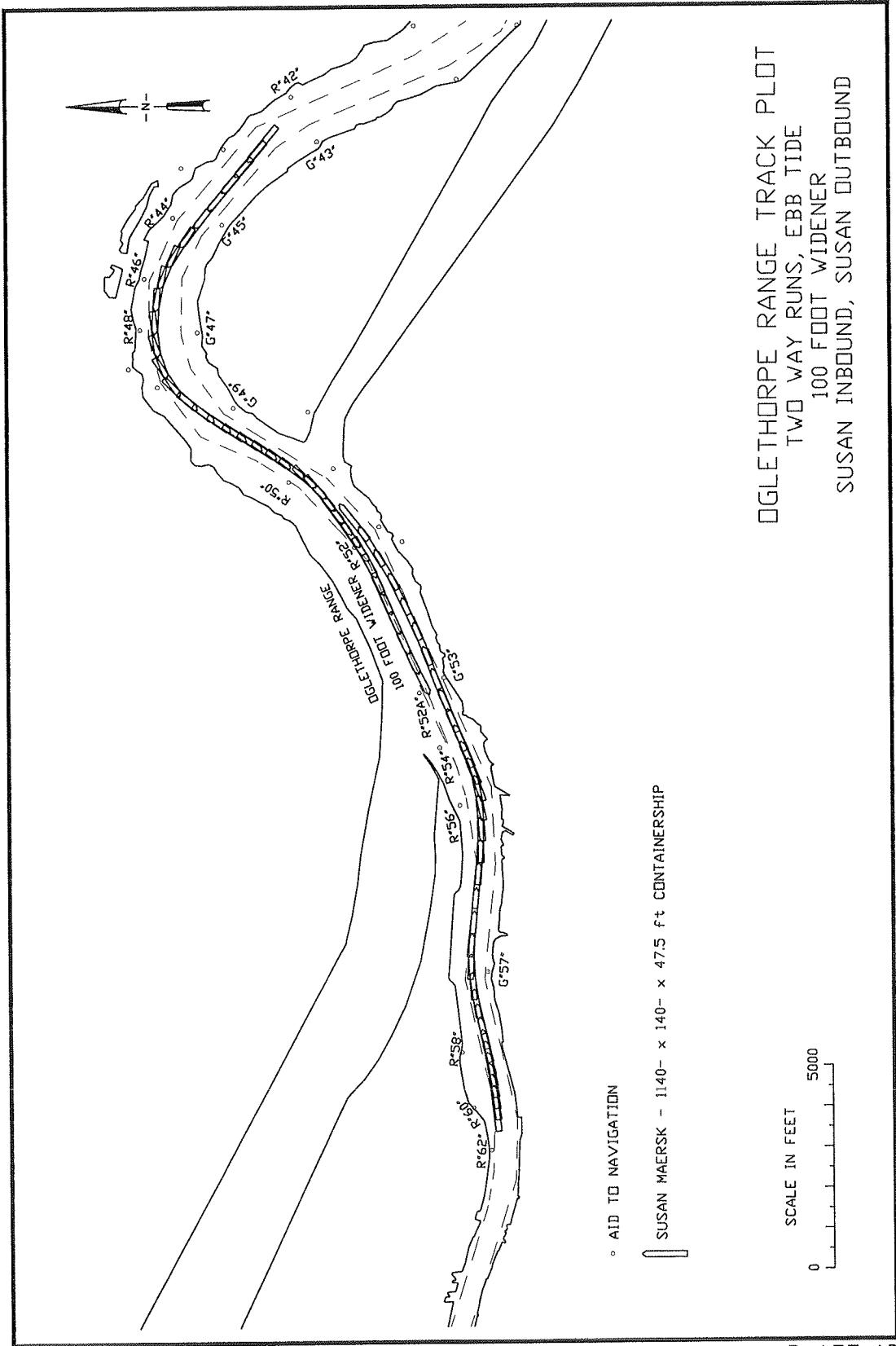


PLATE 18



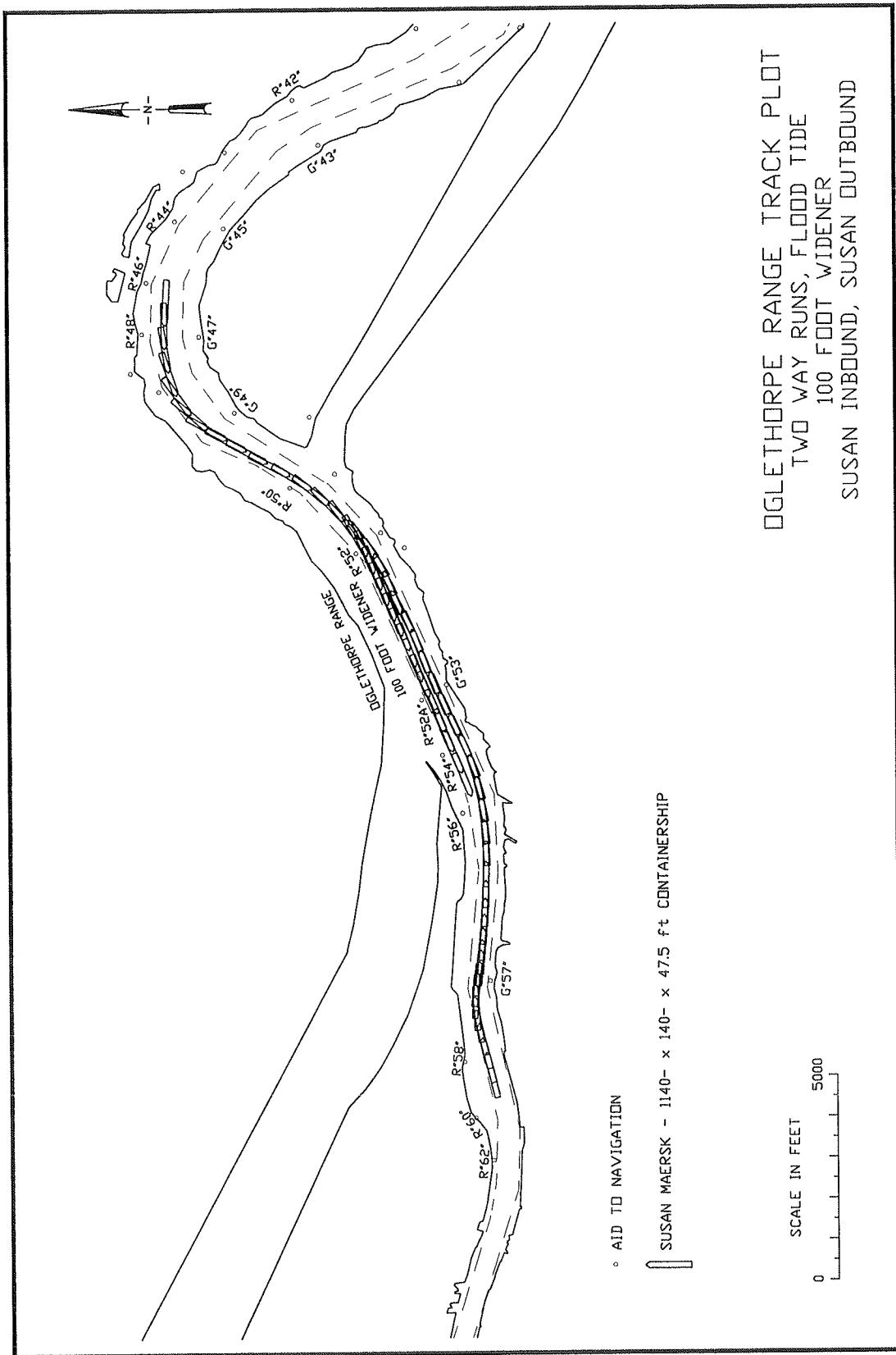
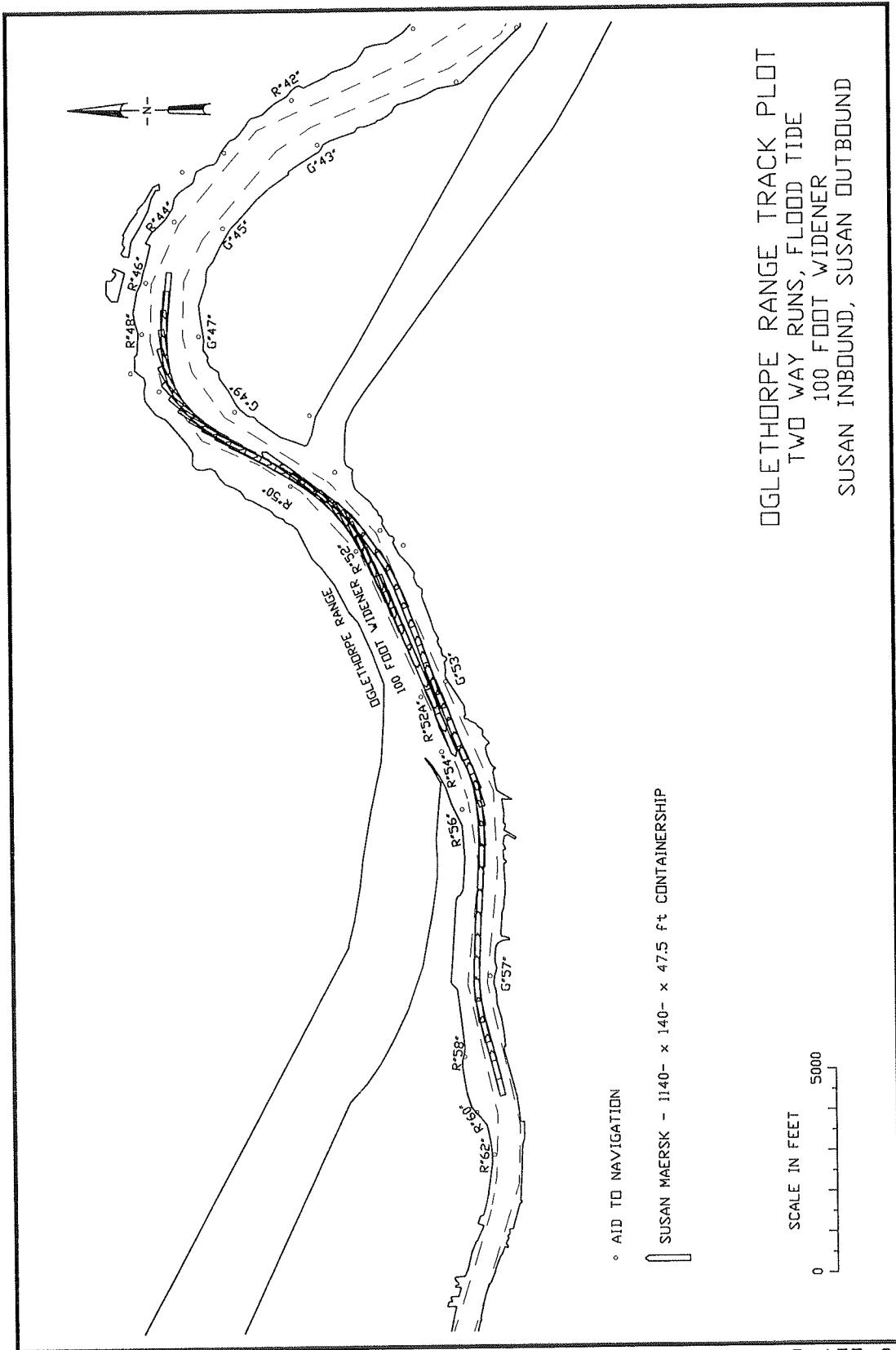


PLATE 20



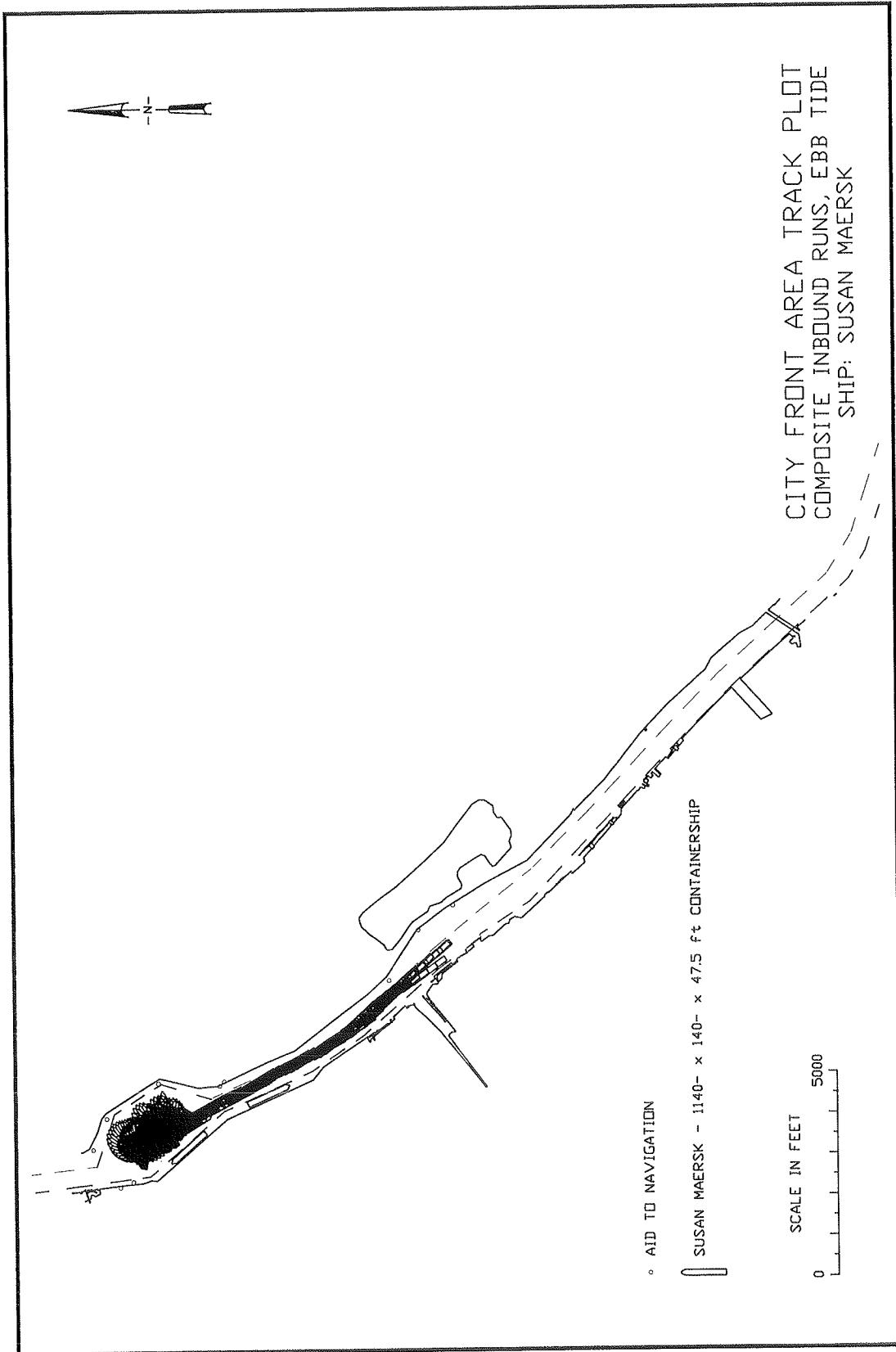
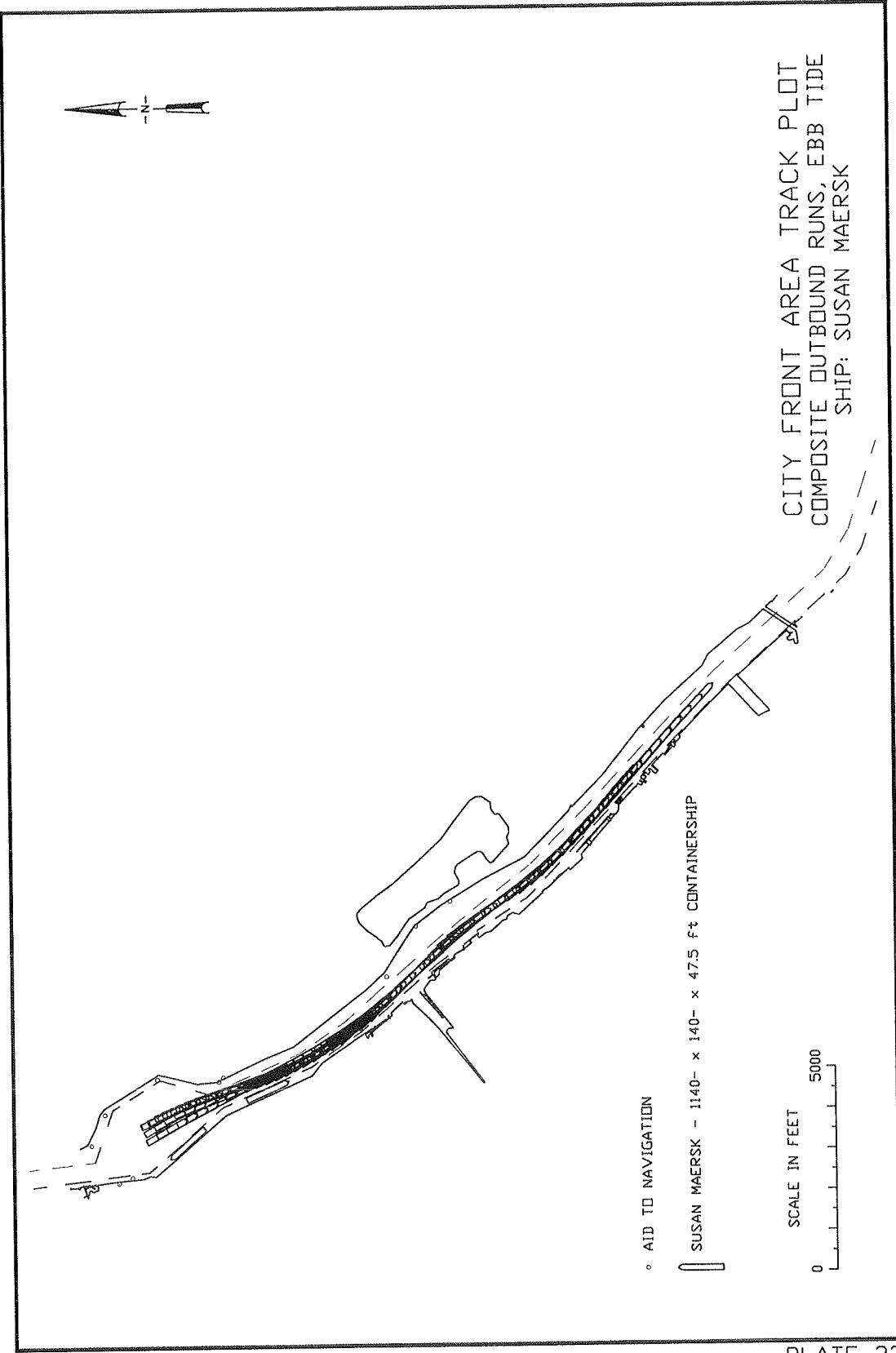


PLATE 22



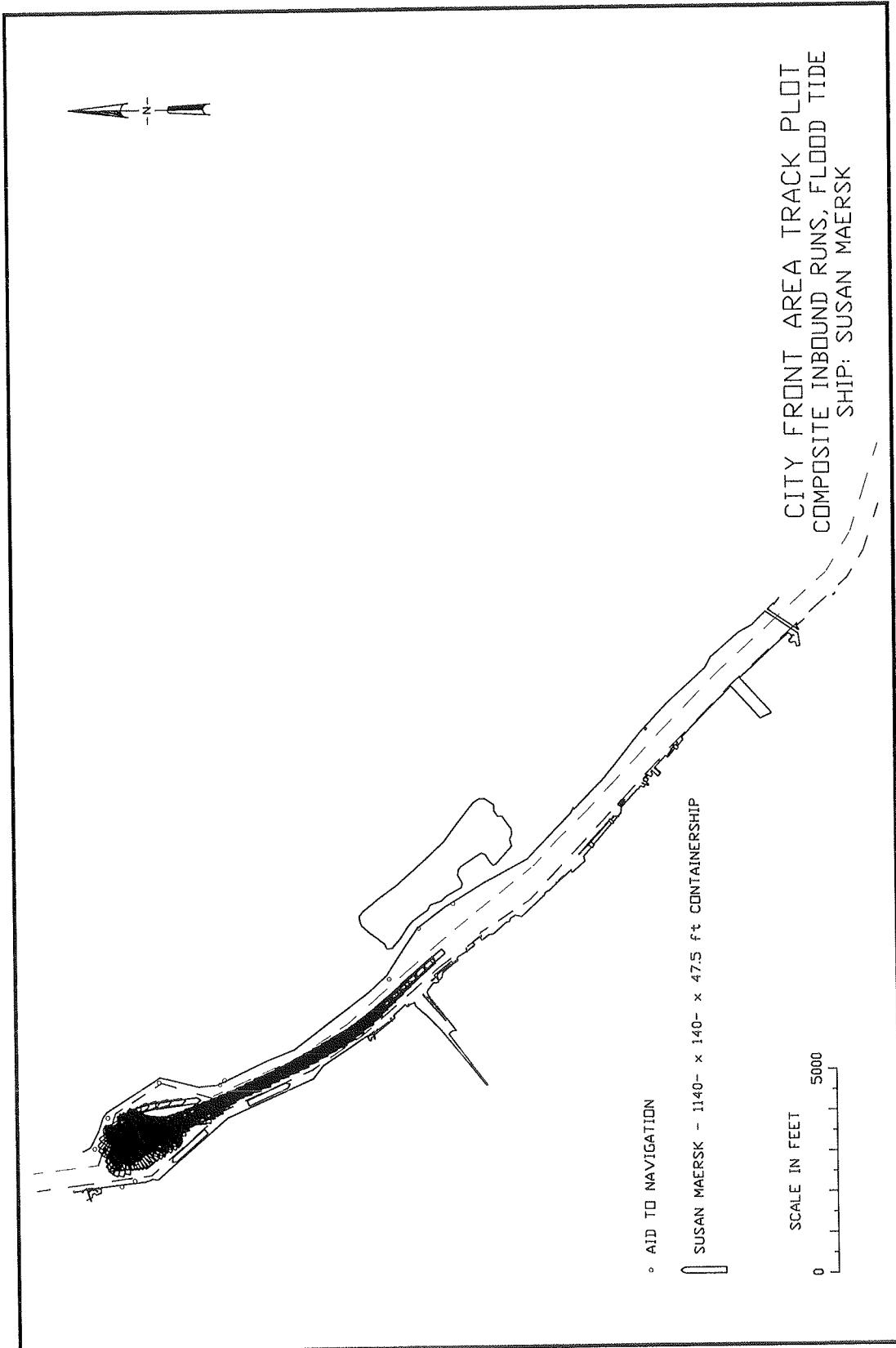


PLATE 24

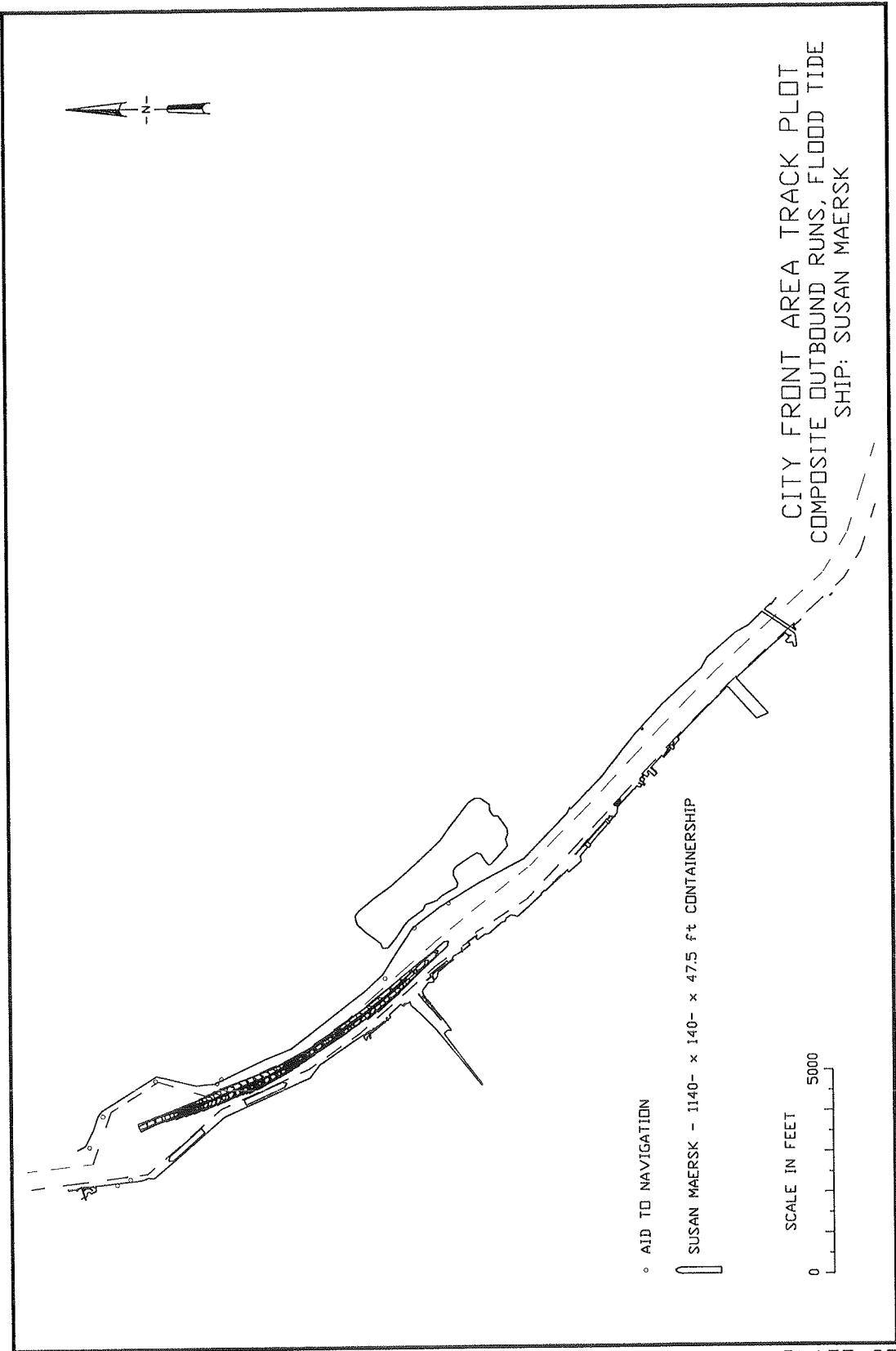


PLATE 25

Date 1-22-09

Pilot: Rick Wesley

1. How long a distance does the physics of two ships meeting require? This is the minimum distance required for two ships to meet.

There are many factors that contribute to this, none of which a minimum. Speed, draft, current, weather, etc. However in this study with the Susan Maersk the minimum should be $3 \times$ the length of each vessel. $1100 \times 3 = 3300 + 3300 = 6600 \text{ ft}$ is a perfect scenario.

2. What circumstances require the passing lane be longer than the distance given as the answer to question 1.

Speed, weather, draft, width of channel, handling characteristics of vessel, Blem,

Questions 3 - 5 pertain to Long Island Range.

3. Was the 500ft passing range adequate, or is 600ft necessary?

No, minimum 6600 ft!!

Answered

Date JAN 16, 2009 Pilot: Rob King

1. How long a distance does the physics of two ships meeting require? This is the minimum distance required for two ships to meet.

BASED ON SIMULATOR WORK, THE REQUIRED DISTANCE FOR TWO SHIPS TO SAFELY MEET IS AT A MINIMUM 3,000 FT.
THIS, HOWEVER, DOES NOT TAKE INTO ACCOUNT THE SAFE PRACTICE OF SETTING UP TO MEET MORE THAN 1 SHIP LENGTH AWAY. MY PERSONAL VIEW ON THIS, BASED UPON PROFESSIONAL EXPERIENCE, IS ABOUT 6,000 FT.

2. What circumstances require the passing lane be longer than the distance given as the answer to question 1.

THE MAIN CONSIDERATION IS TIME. A ONE-MINUTE CHANGE IN THE TIMING OF TWO MEETING SHIPS, CHANGES THE MEETING ZONE BY 1,000 FT.
THERE ARE ALMOST ALWAYS CIRCUMSTANCES BEYOND A PILOT'S CONTROL THAT CAN CHANGE TIMING BY UP TO 45 MINUTES.

Questions 3 – 5 pertain to Long Island Range.

3. For Long Island Range, how long of a passing lane is required for safe two-way traffic of a post-panamax and a panamax ship?

MY RECOMMENDATION IS FOR A MINIMUM OF 9,000 FT.

4. Are there any improvements, such as ATONS, that could reduce that distance?

No.

5. Should the passing range be on the south end of the range, the middle, or the north end?

I IDEALLY, THE ENTIRE RANGE SHOULD BE USED. IF THAT IS NOT POSSIBLE, LOCATING THE PASSING LANE ON THE SOUTHERN END WOULD PROBABLY PROVIDE FOR THE SAFEST, MOST CONVENIENT TRANSIT.

Questions 6 - 8 pertain to Oglethorpe Range

6. For Oglethorpe Range, how long of a passing lane is required for safe two-way traffic of a post-panamax and a panamax ship?

from Buoy 56 to 54,

7. Are there any improvements, such as ATONS, that could reduce that distance?

No.

8. Should the passing range be on the west end of the range, the middle, or the east end?

ONCE AGAIN, I PREFER THE ENTIRETY OF THE RANGE, BUT ON THE EAST END
IF THE AFORESAID IS NOT POSSIBLE.

Questions 9 - 11 pertain to the Marsh Island Channel

9. Did narrowing the west side channel to increase the berthing area make the transit more difficult?

No.

10. If the answer in 9 was "yes," do you still consider the transit safe to make?

11. Are there any improvements, such as ATONS, that could make this transit safer?

No, BUT ALLOWING THE SAME AMOUNT OF CHANNEL BEING TAKEN AWAY
TO BE GIVEN BACK ON THE OPPOSITE SIDE OF THE RIVER WOULD MAKE THIS
A MOOT POINT WITH SAFETY BEING MAINTAINED BOTH FOR MOORED & TRANSITTING
VESSELS.

12. Other comments on this simulation study?

WHILE THERE ~~IS~~ A LARGE DIFFERENCE IN THE RECOMMENDED LENGTH OF PASSING LANES BETWEEN LONG ISLAND RANGE & OAKTHORPE RANGE, IT SHOULD BE NOTED THAT GREATER TRANSIT SPEEDS ON LONG ISLAND NECESSITATE A ~~LONGER~~ ZONE. THE MOST IMPORTANT FACTOR IN BOTH CASES IS TIMING. SINCE THERE IS NO WAY TO ADDRESS ALL OF THE EVENTS THAT AFFECT A PILOT'S TIMING, GIVING MORE ROOM FOR PILOTS TO MANUVER IS THE SAFEST ROUTE.

AS FAR AS THE MARSH ISLAND PROJECT IS CONCERNED, REDRAWING LINES DOESN'T MAKE A DIFFERENCE IN THE ACTUAL PILOTING. IT DOES, HOWEVER, TAKE US INTO LEGAL REALMS THAT WE MAY NOT WISH TO VISIT.

(THADEUVE@GMAIL.COM)

Date 1-16-09 Pilot: John P. Ebberwein

1. How long a distance does the physics of two ships meeting require? This is the minimum distance required for two ships to meet.

In determining this minimum requirement you must consider factors such as size of the ship and outside factors such as wind, current and location in the channel.

The minimum required based on the simulations run this week would be approximately 3 ship lengths.

2. What circumstances require the passing lane be longer than the distance given as the answer to question 1.

Typically in a transit upon the river a ship will be arranging more than one passing during it's transit.

Timing plays an important role in making sure the two vessels meet where they need to.

Questions 3 - 5 pertain to Long Island Range.

3. For Long Island Range, how long of a passing lane is required for safe two-way traffic of a post-panamax and a panamax ship?

In reality it would be ideal to ~~lengthen~~ widen the full length of Long Island to eliminate a bottleneck effect within the length that exists. In manipulating vessels with simulation we were able to pass vessels safely within approximately 9000 ft of passing lane.

4. Are there any improvements, such as ATONS, that could reduce that distance?

ATONS assist us in providing info to boundaries but would not be a factor in reducing the distance needed for passing

5. Should the passing range be on the south end of the range, the middle, or the north end?

In my opinion, South end.

Questions 6 - 8 pertain to Oglethorpe Range

6. For Oglethorpe Range, how long of a passing lane is required for safe two-way traffic of a post-panamax and a panamax ship?

In simulation we were unable to run this scenario.
The suggestion would be from buoy 50 to buoy 54
but timing here is critical.

7. Are there any improvements, such as ATONS, that could reduce that distance?

NO

8. Should the passing range be on the west end of the range, the middle, or the east end?

East end

Questions 9 - 11 pertain to the Marsh Island Channel

9. Did narrowing the west side channel to increase the berthing area make the transit more difficult?

No it does not seem to be more difficult on simulation but ~~will place ships~~ ships proceeding very near the edge of the channel. The ideal situation would be to move the proposed line soft. on the berth side and on the opposite side dredge soft. to allow for less effect on moored vessels.

10. If the answer in 9 was "yes," do you still consider the transit safe to make?

The answer is yes but we were unable to realize the effects of moored vessels in simulation with a ship that is post-panamax size.

11. Are there any improvements, such as ATONS, that could make this transit safer?

No

12. Other comments on this simulation study?

The simulator in many ways allowed us to practice passing ships within the proposed channel modifications safely. There are factors that exist in reality that obviously can not be simulated. On Long Island I believe a dredging of the full length would provide ships with the safest scenario for passing post-Panamax vessels. If that is not feasible then we will pass within the proposed passing lane but I would anticipate more manipulation of transit times and possible delays to larger vessels.

The simulation on Gylethorpe is hard to comment on due to problems with the simulator and the fact that we were unsuccessful in completing a passing in this area.

Kings Island proposal is to prevent ships alongside from resting in the navigable channel. This may also mean at times ships transiting that area may move outside the navigable channel.

Thank you for the opportunity to work on this study and to the staff in Vicksburg for their hospitality! Please feel free to contact me:
Ebberwein@aol.com

Date 1/23/09 Pilot: Trey Thompson

1. How long a distance does the physics of two ships meeting require? This is the minimum distance required for two ships to meet.

I believe ships begin affecting each other two to three ship lengths apart and continue until one to two ship lengths after clearing each other. So for a ship with a LOA of 1000', the very minimum would be around 6000'.

2. What circumstances require the passing lane be longer than the distance given as the answer to question 1.

My answer above speaks to the minimum, ship's speeds cannot be controlled to exactness, therefore some degree of error has to be built in. In order for two ships to meet in a specific area.

Questions 3 - 5 pertain to Long Island Range.

3. Was the 5000 ft passing range adequate, or is 6000 ft or 7000 ft necessary?

As stated above if the two ships could be "point precise" 100% of the time, 5000' could work. But this isn't very realistic. Therefore, 6000' or more is necessary in my opinion to give some room for miscalculation. If it's 7000' or even more, it could be possible ~~to~~ under ideal conditions to meet two ships instead of one. It also allows for more recovery time if the bank effect or suction gets you in trouble.

4. Are there any improvements, such as ATONS, that could reduce that distance?

ATONS WILL BE NECESSARY TO MARK
TO PASSING LANE. BUT THEY WILL NOT
~~HELP~~ HELP IN REDUCING THE LENGTH AT ALL.

5. Do you agree with locating the passing range on the south end of the range?

No. I would rather see it in the middle of
the range for two reasons. Mainly because on ebb
time the outbound is less likely to be able to slow
down and the inbound is at the coast guard station
so he is unable to "hurry up" because of his wake issue.
I believe if an error in precision occurred the ships
would then have to meet in the turn between buoys
26 and 28.

Questions 6 - 8 pertain to Oglethorpe Range

6. For Oglethorpe Range, how long of a passing lane is required for safe two-way traffic of a post-panamax and a panamax ship?

BECAUSE OF THE DIFFERENCE IN THE SIZES OF THESE
SHIPS AND THE SLOWER SPEEDS IN THIS AREA, THE PASSING
LANE COULD BE REDUCED SOMEWHAT. BUT IN MY OPINION
SINCE THESE SHIPS ARE DIFFERENT THE EFFECTS WILL BE REDUCED
ON EACH OTHER ~~SO~~ THE WIDTH OF THE WIDENER COULD BE SMALLER
INSTEAD OF THE LENGTH.

7. Are there any improvements, such as ATONS, that could reduce that distance?

I DON'T BELIEVE THERE ARE ANY IMPROVEMENTS
THAT COULD REDUCE THE DISTANCE. IT'S ALL ABOUT
THE SIZE OF THE SHIPS AND THE TIME REQUIRED
TO MANEUVER IT INTO PLACE.

8. Should the passing range be on the west end of the range, the middle, or the east end?

AGAIN I LIKE THE MIDDLE BECAUSE IF ON
ONE END OF THE OTHER YOUR CHANCES OF MEETING
IN THE TURN ARE INCREASED IF THERE IS A
MISCALCULATION.

Questions 9 - 11 pertain to the Marsh Island Channel

9. Did narrowing the west side channel to increase the berthing area make the transit more difficult?

NO IT IS JUST NOT POSSIBLE TO
MEET IN THIS AREA ANYMORE.

10. If the answer in 9 was "yes," do you still consider the transit safe to make?

11. Are there any improvements, such as ATONS, that could make this transit safer?

NO.

12. Other comments on this simulation study?

AS REALISTIC AS THIS SIMULATION IS, IT IS NOT EXACTLY THE SAME AS HANDLING A SHIP WITH THAT BEING SAID, I DON'T THINK THAT LOOKING AT BARE MINIMUM DISTANCE FOR A PASSING LANE IS A GREAT IDEA. WE ARE ALSO ONLY LOOKING AT ONE SINGLE PASSING. I PERSONALLY HAVE PASSED AS MANY AS THREE OTHER SHIPS ON LOWE (SLAWD).

4. Are there any improvements, such as ATONS, that could reduce that distance?

No.

5. Do you agree with locating the passing range on the south end of the range?

If the entire length can not be widened, either end would work for me.

Questions 6 - 8 pertain to Oglethorpe Range

6. For Oglethorpe Range, how long of a passing lane is required for safe two-way traffic of a post-panamax and a panamax ship?

Because the speed is reduced in this area, the distance could be less than 3x length of the vessels in STANWICH usually are 900-965 (post-panamax; panamax) So $900 \times 3 = 2700 \times 2 = 5400$ ft Around 1 mile.

7. Are there any improvements, such as ATONS, that could reduce that distance?

No.

8. Should the passing range be on the west end of the range, the middle, or the east end?

All of the above !!

Questions 9 - 11 pertain to the Marsh Island Channel

9. Did narrowing the west side channel to increase the berthing area make the transit more difficult?

No - The restrictions caused by the new post Panamax cranes are already doing this.

10. If the answer in 9 was "yes," do you still consider the transit safe to make?

11. Are there any improvements, such as ATONS, that could make this transit safer?

No.

12. Other comments on this simulation study?

I am always amazed & impressed
with the Vicksburg Senator & the
work of the people here. Their attention
to detail work ethic and professionalism
is unchallenged. Thank you for
your help on the Savannah River.

There are too many added
factors that cannot be simulated
making even 7000 ft. too little. The
entire reach of Long Island needs
to be widened.