MCR Dredged Material Disposal Site
Annual Use Plan for 2002

1. Background

The mouth of the Columbia River (MCR) is the ocean gateway for navigation access to/from the Columbia – Snake River navigation system. Each year, the Portland District dredges 3-5 million cubic yards (MCY) of sand at MCR to maintain a 5-mile long deep draft navigation channel. The MCR channel is 2640 ft wide and nominally 55 ft deep (below MLLW).

Maintenance of the MCR project includes disposal of dredged material. Management of a disposal site is predicated on the need to efficiently utilize the site's capacity while minimizing impacts to navigation and offsite environment. The capacity of a dredged material disposal site is the volume (or height and area) of dredged material that can accumulate within a site's boundaries without unacceptable adverse impacts to navigation or the environment. The potential effect of dredged material accumulation upon waves (mound-induced wave shoaling) is an important consideration at MCR. MCR open water dredged material disposal sites available for 2002 are shown in figure 1. General utilization procedures and governing constraints for each disposal site are described in Appendix A. In consideration of stakeholders concerns, USACE and EPA have assigned a target capacity for each disposal site to be used during the 2002 dredging season.

2. Objective

The objective of this *Annual Use Plan* for 2002 is to: A) Provide a decision framework that allows MCR dredging operations managers to manage open water disposal sites on a day to day basis , and B) Define a strategy to collect information (via monitoring or assessment of operational data) on a frequent basis, so that potential problems can be identified and corrective action can be undertaken. The amount of dredged material that can be placed in an open water disposal site is limited by the site's capacity to disperse or accumulate the material without adversely affecting the environment or navigation. The principal site management constraint for MCR is to avoid modification of a disposal site's bathymetry (via dredged material mounding) that could potentially result in excessive wave amplification, due to wave shoaling over mounded dredged material. As proposed, this Annual Use Plan is in place for the 2002 dredging season only. Elements of this site use plan can be changed during the dredging season in accordance with adaptive site management. The final site management and monitoring plan for MCR dredged material disposal sites will be developed during EPA's final site designation process.

The 2002 *annual use plan* describes how each MCR dredged material disposal site will be used and monitored. Conducting frequent bathymetry surveys at active MCR disposal sites, during the dredging season, will be the principal monitoring tool used to accomplish the site utilization objective.

The 2002 *annual use plan* is based on adaptive management. This means that MCR disposal sites will be proactively managed: As sites are used, they are monitored to verify that the sites are being managed according to 2002 capacity targets. If a given disposal site is at or near its target capacity, then site management changes accordingly. The *annual use plan* implements various recommendations made by a "*Federal Review Team"* [USACE 2001] which was convened in September 2001 for the purpose of reviewing management practices at MCR dredged material disposal sites.

3. Site Management Criteria

Geometrically, the target capacity for a given disposal site is defined by the target height and area over which dredged material can accumulate (collectively referred to as a "target accumulation"), with respect to a baseline condition. Use of an active disposal area will be discontinued upon reaching the specified target accumulation. The target accumulation is based on the desire to limit dredged material accumulation such that mounded dredged material does not excessively amplify waves, due to shoaling and refraction. The target accumulation can be different for each disposal site.

Values for limiting the accumulation of dredged material were obtained using the RCPWAVE model [Ebersole 1986] as discussed in USACE [1999 and 2002]. RCPWAVE is a computer program that simulates the behavior of waves as they interact with variable bathymetry (or in this case, underwater mounds). It must be noted that results obtained using RCPWAVE can be 10-50% higher than the actual case: The RCPWAVE program overestimates how waves interact with variable bathymetry (the model conservative). The target mound heights given in table 1 are conservative and provide a safe operational limit.

Table 1 presents the target mound heights applicable for MCR disposal sites and Appendix A discusses site specific details concerning target mound heights, site utilization, and present disposal site capacity. Because of the need to assign capacity and concern for navigation safety, thresholds for increasing the level of monitoring intensity and management responses have been identified. The "target mound height" values shown in table 1 are intended to be used only as an ODMDS management guide (a screening tool to identify site management thresholds for concern). It is important to note that the values shown in Table 1 apply to a mound feature that occupies an area of 2,000 x 2,000 ft. For smaller mound features that are equal to or marginally exceed the "target mound height" values, there may be little or no wave amplification [USACE 2002]. **The target mound height** corresponding to the **"present"** site condition (April 2002) is the parameter that applies to the utilization of sites during 2002.

Concern should arise only if the level of accumulation significantly exceeds the target height and/or the area of accumulation exceeding the target value becomes greater than 2,000 x 2,000 ft. Examination of wave amplification potential will be conducted only if dredged material accumulates to levels that far exceed the "target mound height" and/or covers an area larger that 2,000 x 2,000 feet. Should this occur, the STWAVE model [Smith 2001] will be used to assess whether the area of accumulation may potentially affect waves in or near the disposal site in question. Although RCPWAVE is considered an appropriate model for establishing conservative target mound heights, STWAVE is more accurate and considered to be more suitable for predicting actual conditions.

Table 1. Target height of dredged material mounds, based on the RCPWAVE model. Values to be used for screen level assessment of disposal site capacity.

Disposal Site	Target Mound Height with respect to Baseline	**Present**	Usable Disposal Site Area(acre)	Present Site Capacity Volume (CY)
SW Site – East	5	**6**	190	1.7 M
SW Site – West	5	**2**	290	800 K
NJ Site*	8	**6**	110	500 K
Site F	15	**6**	900	6 M
Site A^	5	**4**	115	500 K

SW Site = Shallow Water Site (Site E)
* = The NJ is not subject to the same target mound geometry criteria as unprotected sites. For 2002, Capacity of Site NJ has been set at 500 kcy to minimize potential transport to areas near the MCR nav channel. This is less than "area of site x target mound height).
^ = Due to the nature of the existing bathymetry at this site, it is prudent not to initially rely on the full site capacity. Placement within During 2002, use of Site A would be would limited to the southwestern half of the site.

4. Decision Framework for Site Threshold Management

Based on the above site management criteria, there are 6 action levels that will be used for managing disposal site capacity at MCR. The objective of the Annual Use Plan is to avoid any action level above "Level 4".

Level 1. **Normal Capacity Level** = Dredged material accumulation is not close to the accumulation target. ACTION: Proceed as planned.
Level 2. **Limited Capacity Level** = Dredged material accumulates to within 1-2 ft of the allowable target. ACTION: Minimize placement in affected location.
Level 3. **Threshold Capacity Level** = dredged material accumulates to (or marginally exceeds) the target mound height within localized extent (less than 500 x 500 ft). ACTION: Avoid placement in the affected location of accumulation. Continue to use adjacent areas within site appropriately.
Level 4. **Limited Management Level** = dredged material exceeds target mound height by 1-2 ft within an area greater than 500 x 500 ft. ACTION: Avoid placement in the affected location of accumulation and in adjacent areas. Continue to use areas not affected; adopt early exit strategy for site.

Level 5. **Moderate Management Level** = dredged material exceeds target mound height by 1-2 ft within an area greater than 1,000 x 1,000 ft. ACTION: Stop using site, until natural erosion has restored sufficient site capacity.
Level 6. **General Management Level** = dredged material exceeds target mound height by more than 2 ft within an area greater than 2,000 x 2,000 ft. ACTION: Stop using site. Assess potential wave impacts using STWAVE and determine appropriate action based on results.

5. Strategy

The goal of managing MCR disposal sites is to fully utilize each site, while limiting the average vertical accumulation of placed dredged material so as to minimize the potential for adversely affecting wave conditions at or near the site. To successfully manage each site throughout the dredging season, the capacity of each site must be frequently assessed.

As a general rule, capacity assessment for an *active* disposal site (one that is being used) will occur based upon the frequency at which a given site's bathymetry is surveyed. The frequency of conducting surveys will be directly related to the rate at which dredged material is placed within a given site. In this regard, the frequency for assessing active disposal sites will be based on the rate of volume of dredged material placed within the site. The Portland District (OP-NW) will, on a weekly basis collect operational data (involving dredging/disposal activity at MCR). This will typically be done on Tuesdays. Also on a weekly basis, Portland District (OP-NW) will prepare a report that summarizes the volume of dredged material placed and relate this data to the changes in capacity for active MCR disposal sites and, make recommendations for utilizing each site for the next week. Active sites will be assessed according to the management thresholds listed in Section 4 "Decision Framework for Site Threshold Management". The weekly report will be furnished via email, typically by the Friday of that week, to the members of the MCR Update Distribution List maintained in OP-NW.

Use of an active disposal site may be temporarily discontinued based on management indicators which could be the potential for exceeding the target accumulation within the site, the status or location of the dredges and hydrosurvey boats, priority use of sites, or other site use constraints. Weekly recommendations may address revision of monitoring needs (i.e. site bathymetry surveys) or the collection of additional operational data to be used for the purpose of improving the assessment of disposal site capacity. Data required to monitor the weekly progress of site utilization includes: bathymetry surveys; analysis of surveys (plotting, differencing, or other processing); tracking of disposal locations within each site; and other pertinent information provided by the dredge captains. Figure 2 shows the flow diagram describing the procedure of processing monitoring data and using the processed data to manage disposal site capacity.

Within the collective constraints of available MCR disposal sites, preference will be given to using the Shallow Water Site (Site E) and the North Jetty (NJ) site. The contract dredge will be placing approximately 25,000 to 50,000 cubic yards of material at the Benson Beach location this dredging season and approximately 1.5 M cubic yards in the Shallow Water site. Placement of the Benson Beach material will impact timing of use

of the NJ site due to the dredge accessing the beach. When either the Shallow Water Site or the NJ site are no longer sufficient to meet the requirements for dredged material disposal or access to Benson Beach is required, Site F would be used. Site A would only be used if all other disposal options were not sufficient to meet the needs at MCR. It is noted that the Shallow Water Site will require focused attention (during dredged material placement and monitoring) to ensure that the site is fully utilized without exceeding the site's capacity. The Shallow Water Site will be managed such that the site may be under-utilized, rather than attempting to achieve full utilization of the site at the risk of exceeding the site's capacity constraints. Figures 3a-b shows the flow diagram describing the procedure for directing the government and contractor dredges to specific MCR disposal sites.

6. Survey Frequency for Monitoring Dredged Material Accumulation

Minimum site monitoring requirements are a pre- and post -disposal bathymetry survey for each active MCR disposal site and a 2 x 2 mile area on Peacock Spit. Refer to figure 4 for survey coverage at MCR. The Shallow Water Site and the North Jetty Site will be surveyed at least once a month during the 2002 MCR dredging season. For active disposal sites, the survey frequency may differ from the minimum requirements, as specified below.

For all sites that are actually being used, an alternative Frequency for Site Monitoring (FSM) will be based on: The volumetric rate ($\forall$) at which dredged material is begin placed, the area (A) over which the dredged material is being placed, and the vertical target (H) for dredged material accumulation. It is noted that as a given site is "filled" with dredged material, H will change (become less with time). The FSM may need to increase as a site is being filled. FSM will be re-assessed each time an active site is surveyed. An entire disposal area need not be surveyed during each survey; only the parts of the site receiving dredged material and adjacent areas (within 1,000 ft of disposal activity). If the FSM becomes too frequent, then the disposal area should be considered "filled" and not used until sufficient dredged material dispersion occurs (as determined by site monitoring).

The following relationship was used to determine survey frequency for each site. Note that FSM (equation 1) assumes: The survey will be conducted at the midpoint of a site's total remaining capacity; dredged material is continuously placed at the site; and 20% of the site's area is not used. Table 2 specifies the initial FSM for each site based on initial conditions for 2002 and other parameters as shown. Note that the FSMs in table 2 will require revision as the capacity (allowable accumulation height) of each site is reduced by dredged material disposal.

Frequency of Site Monitoring (FSM) = (H/2) x (A*0.8/∀) [Equation 1]

Example: Initial FSM for the Western half of the SW site (Site E) is estimated
= (2/2) x (290*43560*0.8 /50,000*27) = 8 day.
…this is halfway thru the total time expected to fill the site.

Table 2. Values used to estimate Initial Frequency of Site Monitoring (FSM) for 2002.

Disposal Site	Target Mound Height (H,ft)*	Area (A, acres)*	Volume of DM Placed (∀,CY/day)♣ *Government*		*Contractor*	FSM** (days)
SW Site – East	6	190	50,000	or	48,000	15
SW Site – West	2	290	50,000	or	48,000	8
NJ Site	6	110	50,000		not used	5
Site F	6	900	35,000	and	32,000	50
Site A	4	115	45,000		not used	7

* = Based on present values and will change as a site is filled; may be redefined based on subsequent site surveys.

**= time interval between FIRST successive surveys, assuming site in continuously used AND that dredged material is placed evenly throughout available disposal area.

♣= values based on recent average production rates – values will be changed if 2002 production rates are higher

As a given disposal site is "filled", the interval between successive surveys will become smaller. Table 3 shows an estimated schedule for surveying MCR disposal sites during 2002, assuming that disposal occurs continuously in the site and that dredged material is placed uniformly within the available area. The values shown in () are the revised FSMs, following the initial value. An example of how to read table 3 is given for the Shallow Water site – Eastern half, and assumes that dredged material is placed continuously and evenly placed from day 1:

1) 15 days after commencement of the disposal operation, the site would be surveyed and assessed.
2) After 8 additional days, the site would be re-surveyed and re-assessed. The total time for disposal would be 23 days.
3) After 4 additional days, the site would be re-surveyed and re-assessed. The total time for disposal would be 27 days.
4) After 2 additional days, the site would be re-surveyed and re-assessed. The total time for disposal would be 29 days.
5) After 1 additional day, the site would filled. The total time for disposal would be 30 days.

Table 3. Estimated successive frequency of site monitoring.

Disposal Site	Initial FSM	2nd FSM	3rd FSM	4th FSM	5th FSM
	days, starting from when site is first used in 2002 (days from previous FSM)				
SW Site – East	15	23 (8)	27 (4)	29 (2)	30 (1) Filled –1.7MCY
SW Site – West	8	12 (4)	14 (2)	15 (1)	Filled--800KCY
NJ Site	5	8 (3)	10 (2)	11 (1)	Filled--500KCY
Site F	50	75 (25)	87 (12)	93 (6)	96 (3) Filled--6MCY
Site A	7	11 (4)	13 (2)	14 (1)	Filled—500KCY

Values indicate cumulative time for which site has been used during 2002.
Values in () indicate successive FSM; or the time that the site can be used been used between successive surveys.

7. Alternating of Active Disposal Sites during Monitoring and Other Conditions

Under the present contracting agreement, the contract dredge will place dredged material within the SW Site and at Benson Beach. The government dredge will be using the NJ Site; Site F; the east half of the SW Site and if needed in Site A.

Under certain conditions active disposal sites will be left alone and others will be used. For example, the government dredge has no on-dredge survey capability. This means that when the SW Site or the NJ Site (that is being used by the government dredge) is being surveyed to assess remaining site capacity, the government dredge will use another disposal site until the site's remaining capacity has been assessed. This will typically take 2-2.5 days. During each site assessment period, the government dredge will use the NJ site, if available, for 2 days and Site F for the balance of time. The government dredge will use Site F while the NJ Site is being assessed. Timing of the use of the NJ site will be affected by placement of material in the Benson Beach location.

The contract dredge does have survey capability and can monitor for site capacity during disposal, as required in the contract plans and specifications. USACE will also monitor the contractor disposal area according to the FSM. However, the contractor will not need to depart the active site during USACE surveys of site capacity assessment, UNLESS we are in a management threshold above Level #1 ("limited capacity level" or higher). In which case, the contractor will need to leave the active site and use another while USACE determines present site capacity (2-2.5 day activity).

During periods of rough bar conditions; the SW Site or the NJ Site may not be available for use; in which case Site F will be used. During 2002, use of Site A is not expected unless unforeseen conditions mandate.

8. Refinement of Site Capacity Use

Use grids (500 x 500 ft) for NJ and the SW Site in concert with target mound heights (elevations) for dredged material accumulation; to refine use of each site as it fills up. As areas of a site become filled; the filled cells are no longer used. To facilitate coordination

and site assessment, the same placement grid would be used by the contractor and government dredges

9. Data Reporting Requirements

Field Data to NWP: Field offices and NWP information sharing updates; every Tuesday. Disposal coordinates to NWP-OP-NW either digital or clear FAX twice weekly while dredges are working MCR. Other data may be transferred to OP-NW, as adaptive site management requirements dictate.

Updates from NWP to Public: Send out email updates to interested stakeholders every Friday. Other data may be sent, as adaptive site management requirements dictate.

APPENDIX A

MCR Disposal Site Utilization Procedures and Governing Constraints

Information used to formulate the use strategy for individual MCR disposal sites was obtained from the annual report "*Utilization of MCR Ocean Dredged Material Disposal Site during 2001 and Recommendations for 2002"* [USACE 2002]. All water depths are specified with respect to MLLW.

Shallow Water Site (Site E): As of 25 April, the *total* target capacity within Site E was about 3.5 MCY (this assumes that dredged material accumulates to the target level-5ft throughout the entire site accounting for dredged material side slope only). The site's present *effective* target capacity is 2.5 MCY; this is the volume that can be realistically placed within the site (accounts for slope of placed dredged material, "limited capacity zones", and "non-effective areas"). Refer to figures 5 and 6 for Site E constraints. It is recommended that Site E be managed in two parts; an eastern half (present target capacity = 1.7 MCY), and a western half (present target capacity = 800 KCY). The western half of the site is less dispersive than the eastern half of the site and will be unavailable for dredged material disposal after 15 August. The target capacity of Site E is defined by a 5-ft vertical target for which dredged material can accumulate with respect to the site's baseline condition (May 1997). Figure 5 shows the *target contour elevations* for Site E: These contours account for a 5-ft accumulation added onto the site's baseline bathymetry. Figure 6 shows the height at which dredged material can accumulate within the site, without exceeding the 5-ft target (with respect to May 1997), based on the 25 April 2002 survey. As of 25 April, the average height of accumulation at the target contour elevations for the eastern and western halves of Site E is 6 ft and3 ft respectively. Due to the goal of not accumulating more than 5 ft of dredged material vertically within Site E (with respect to. May 1997), dredged material should be placed such that it accumulates uniformly throughout the site: This means that an entire site should be utilized, to the maximum extent practicable.

NJ Site: The average water depth within Site NJ is about 45 ft. The present target capacity of the NJ site (for the 2002 dredging season) is 500 KCY, assuming that 70% of the NJ site is permitted to accumulate dredged material to a height of 8 ft (with respect to the site's baseline 1999 condition). Due to the relatively shallow water depths thru the NJ Site, care should be taken to place dredged material such that it accumulates evenly within the site. It may be advantageous to first use the eastern half of the NJ site, then fill in the western half; so as not get "blocked" from using the eastern half of the site--- should accumulation within the western part of the site restrict dredged access due to keel clearance.

Site F: The average water depth within Site F is about 130 ft. The total remaining target capacity of Site F is at least 6 MCY, assuming that only the northwestern half of the site is used (not including the "avoidance zone"). Refer to figure 7 for Site F layout. When using Site F, dredged material should be placed uniformly within the assigned area of northwestern half of the site. Dredged material accumulation during 2002 should not

exceed a height of 6 ft (or 15 ft, relative to the 1981 baseline condition) within the assigned placement area of Site F.

Site A: Site A is located in average water depth of 60 ft. As presently described in applicable permits, Site A can handle no more than 500 KCY of dredged material placement. Dredged material should be placed such that is accumulates uniformly within the assigned area. Theoretically, the target for vertical accumulation of dredged material placed within Site A is about 5 ft. Due to the presence of a large relic mound of dredged material; dredged material placed during 2002 should not accumulate higher than 4 ft relative to the pre-disposal (Spring 2002) bathymetry. For the same reason, only the outer (southwestern) half of the site should be used.

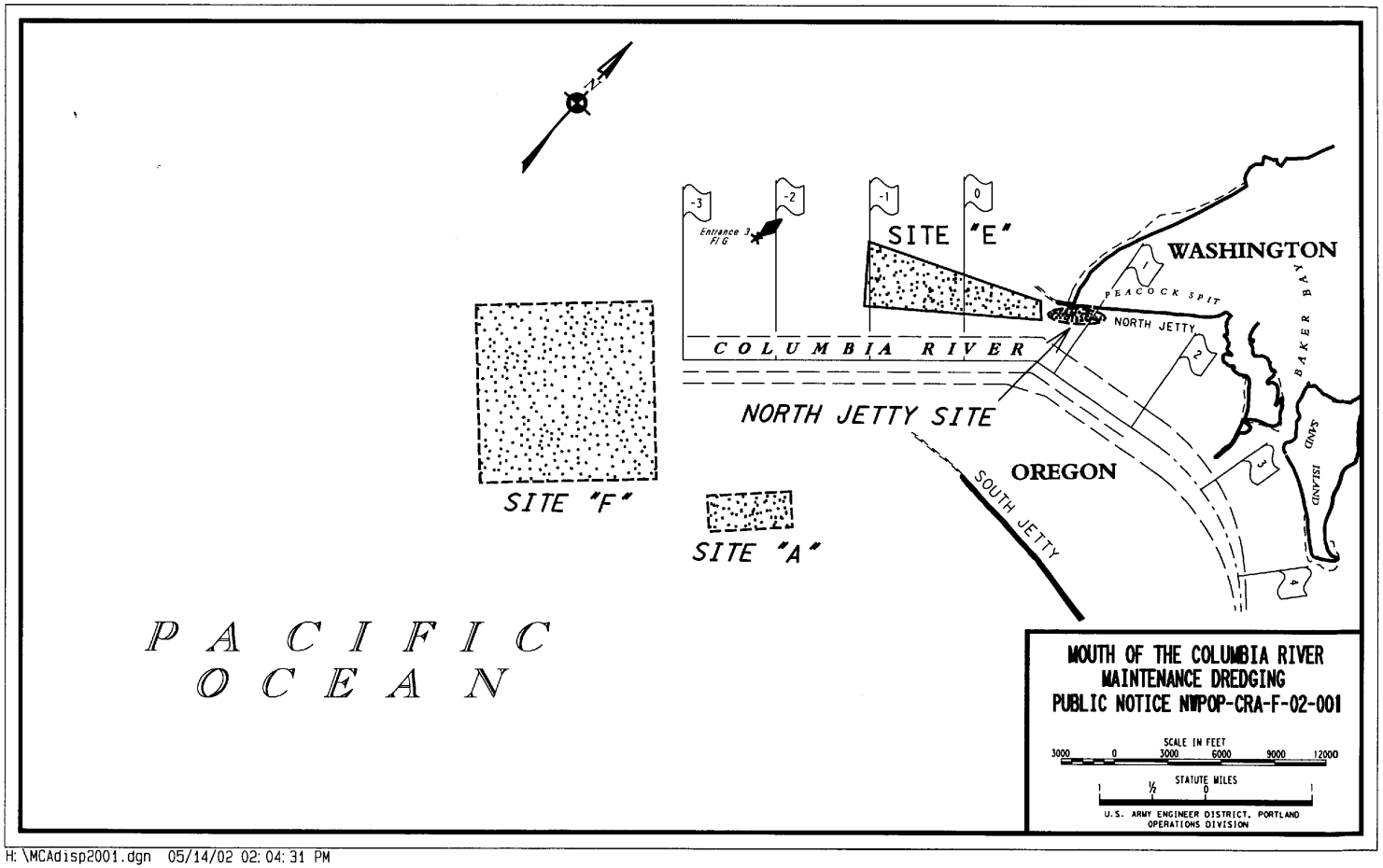
Ebersol (1986). "Regional Coastal Processes Numerical Modeling System: RCPWAVE – A linear wave propigation model for engineering use", TR CERC-86-4, Waterways Experiment Station, USACE, Vicksburg, MS.

Smith, J.M., Sherlock, A.R., Resio, D.T. (2001) " STWAVE: Steady-State Spectral Wave Model User's Manual for STWAVE, Version 3.0". ERDC/CHL SR-01-1. U.S. Army Corps of Engineers - Engineer Research and Development Center. Vicksburg, MS.

USACE (1999). "Integrated Feasibility Report for Channel Improvements and EIS: Appendix H, Volume I, Exhibit B". Portland District – US Army Corps of Engineers.

USACE (2001). "Report of an Independent Federal Review Team on Management of Dredged Material Disposal Sites at the Mouth of the Columbia River -Portland District– US Army Corps of Engineers.

USACE (2002). "Utilization of existing MCR ODMDSs during 2001 and Recommendations for 2002". Portland District – US Army Corps of Engineers.


-3
-2
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Entrance 3
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SITE "E"
WASHINGTON
PEACOCK SPIT
NORTH JETTY
COLUMBIA RIVER
BAKER BAY
SAND ISLAND
NORTH JETTY SITE
OREGON
SOUTH JETTY
SITE "F"
SITE "A"
PACIFIC OCEAN
MOUTH OF THE COLUMBIA RIVER
MAINTENANCE DREDGING
PUBLIC NOTICE NWPOP-CRA-F-02-001
SCALE IN FEET
3000 0 3000 6000 9000 12000
STATUTE MILES
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U.S. ARMY ENGINEER DISTRICT, PORTLAND
OPERATIONS DIVISION
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Figure 1

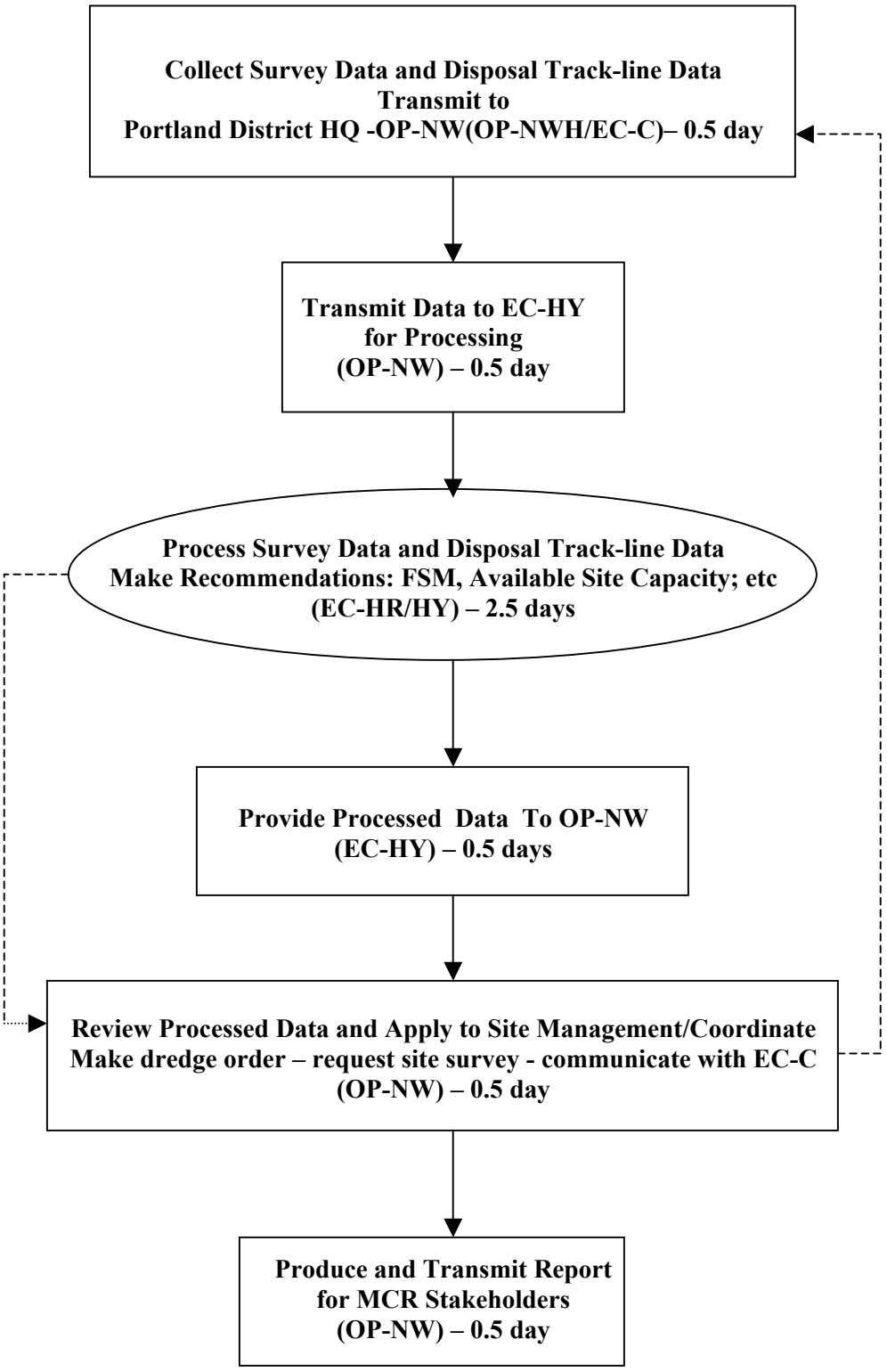

Figure 2. Flow diagram describing the procedure of processing monitoring data and using the processed data to manage disposal site capacity. Offices shown in () are assigned responsibility for task; expected duration of task is specified.

Government Dredge

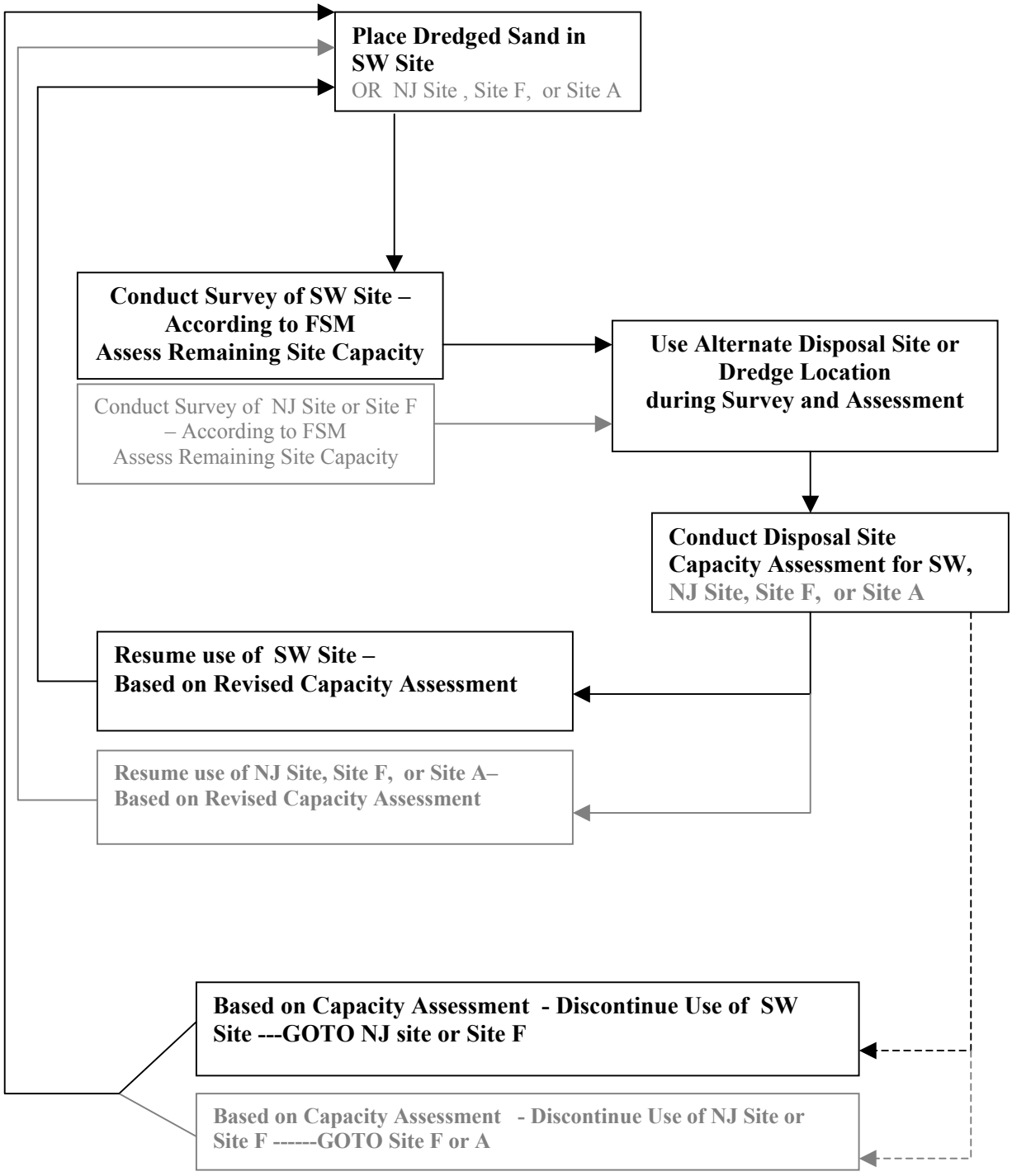

Figure 3a. Flow Diagram describing Action events for government dredge Essayons during dredging-disposal at MCR for 2002.

Contract Dredge

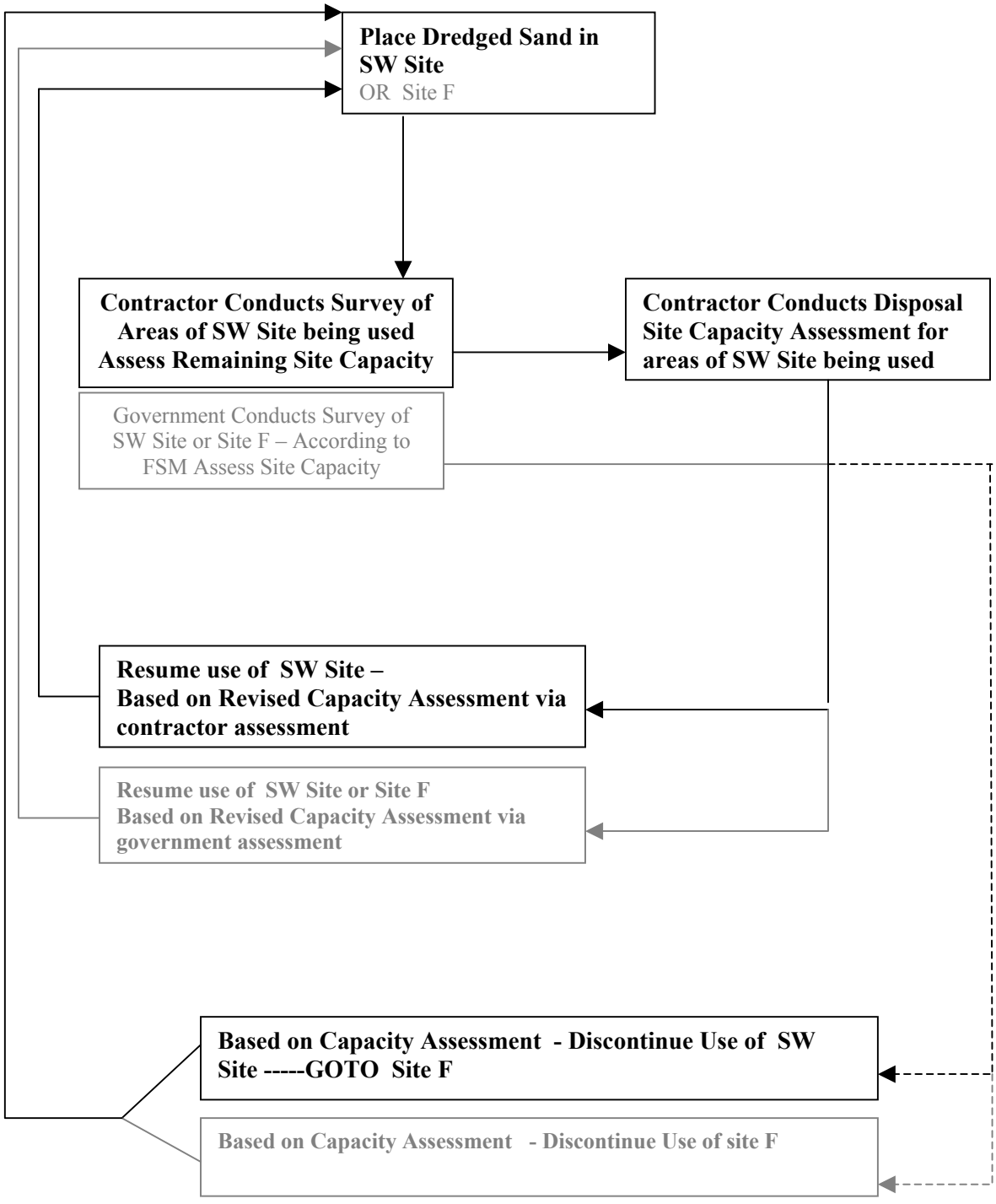

Figure 3b. Flow Diagram describing Action events for contract dredge during dredging-disposal at MCR for 2002.

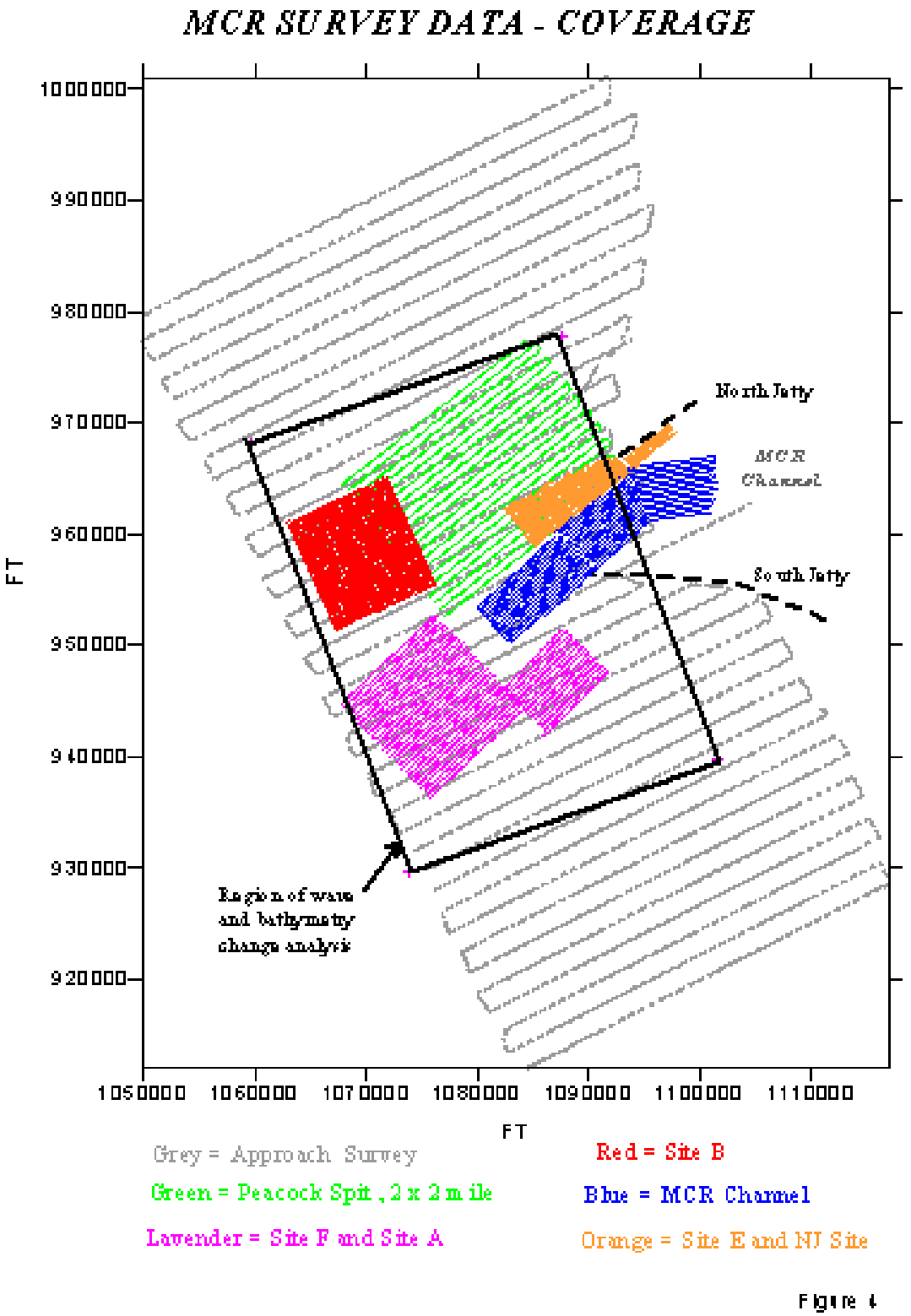
MCR SURVEY DATA - COVERAGE
1000000
990000
980000
970000
960000
950000
940000
930000
920000
FT
1050000
1060000
1070000
1080000
1090000
1100000
1110000
FT
North Jetty
MCR Channel
South Jetty
Region of wave and bathymetry change analysis
Grey = Approach Survey
Red = Site B
Green = Peacock Spit, 2 x 2 mile
Blue = MCR Channel
Lavender = Site F and Site A
Orange = Site E and NJ Site

Figure 4

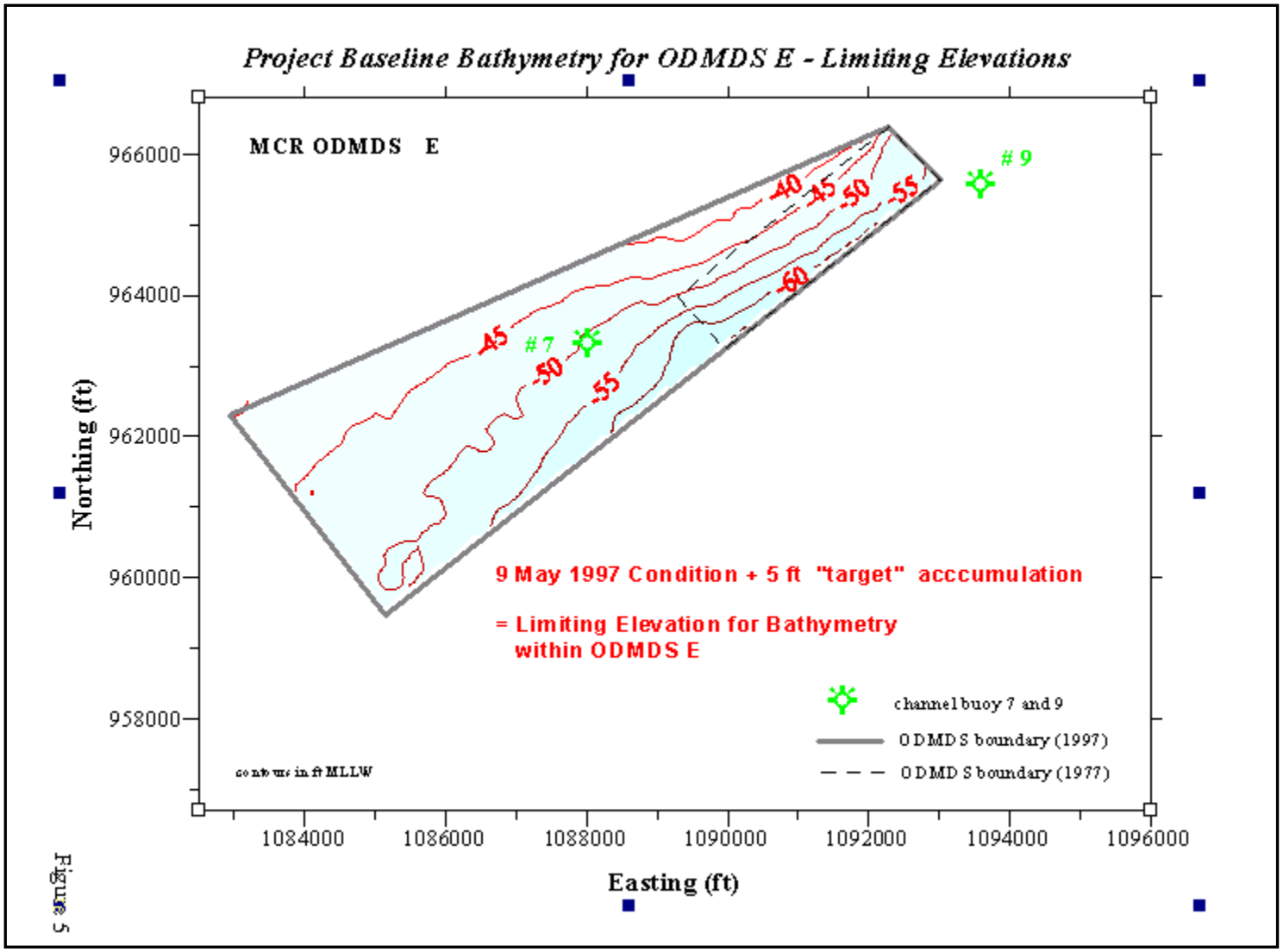
Project Baseline Bathymetry for ODMDS E - Limiting Elevations
MCR ODMDS E
9
7
-40
-45
-50
-55
-60
-45
-50
-55
9 May 1997 Condition + 5 ft "target" acccumulation
= Limiting Elevation for Bathymetry within ODMDS E
channel buoy 7 and 9
ODMDS boundary (1997)
ODMDS boundary (1977)
contours in ft MLLW
966000
964000
962000
960000
958000
Northing (ft)
1084000
1086000
1088000
1090000
1092000
1094000
1096000
Easting (ft)

Figure 5

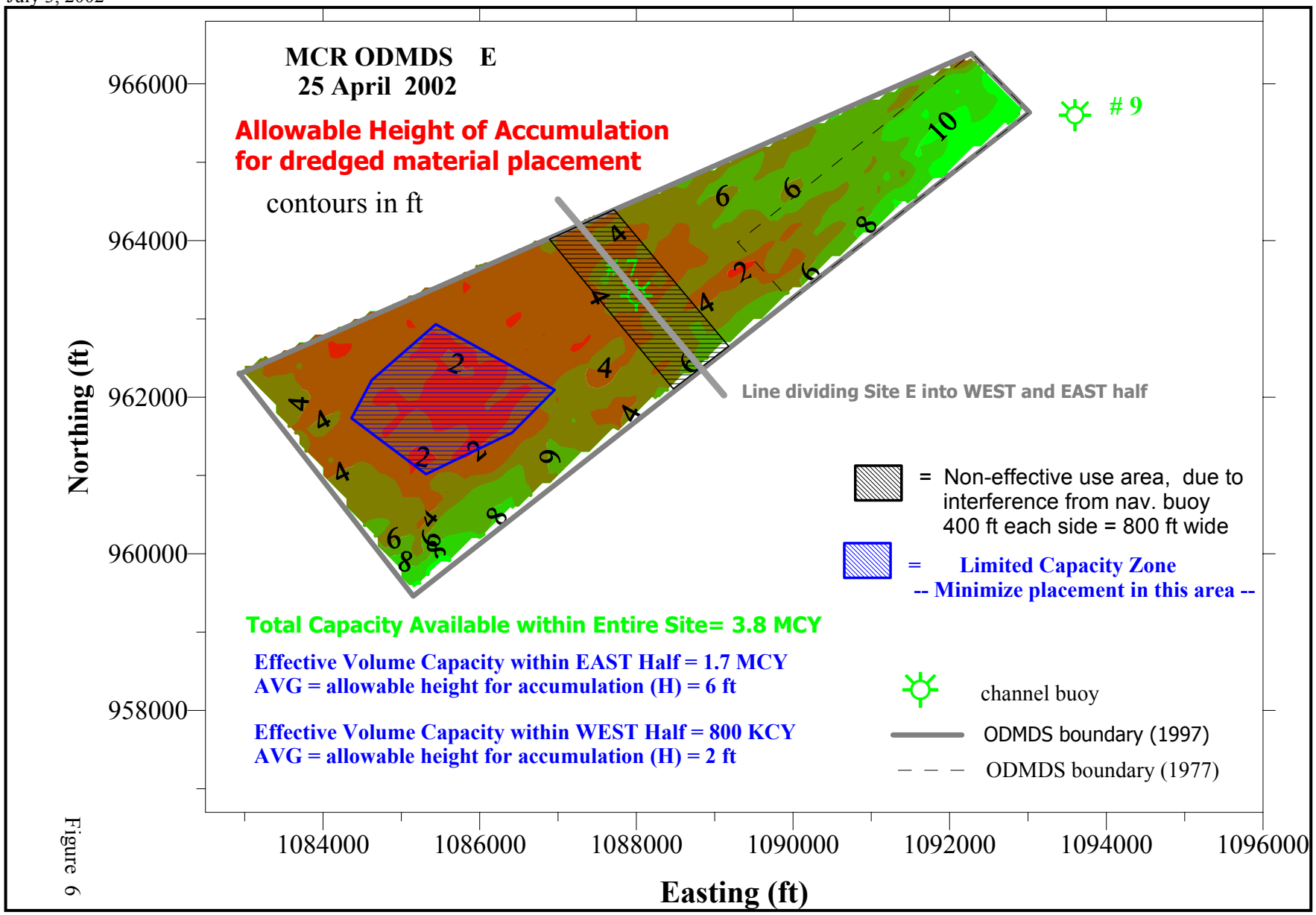
MCR ODMDS E
25 April 2002
Allowable Height of Accumulation
for dredged material placement
contours in ft
9
Line dividing Site E into WEST and EAST half
= Non-effective use area, due to interference from nav. buoy 400 ft each side = 800 ft wide
= Limited Capacity Zone
-- Minimize placement in this area --
Total Capacity Available within Entire Site= 3.8 MCY
Effective Volume Capacity within EAST Half = 1.7 MCY
AVG = allowable height for accumulation (H) = 6 ft
Effective Volume Capacity within WEST Half = 800 KCY
AVG = allowable height for accumulation (H) = 2 ft
channel buoy
ODMDS boundary (1997)
ODMDS boundary (1977)
Northing (ft)
966000
964000
962000
960000
958000
1084000
1086000
1088000
1090000
1092000
1094000
1096000
Easting (ft)

Figure 9

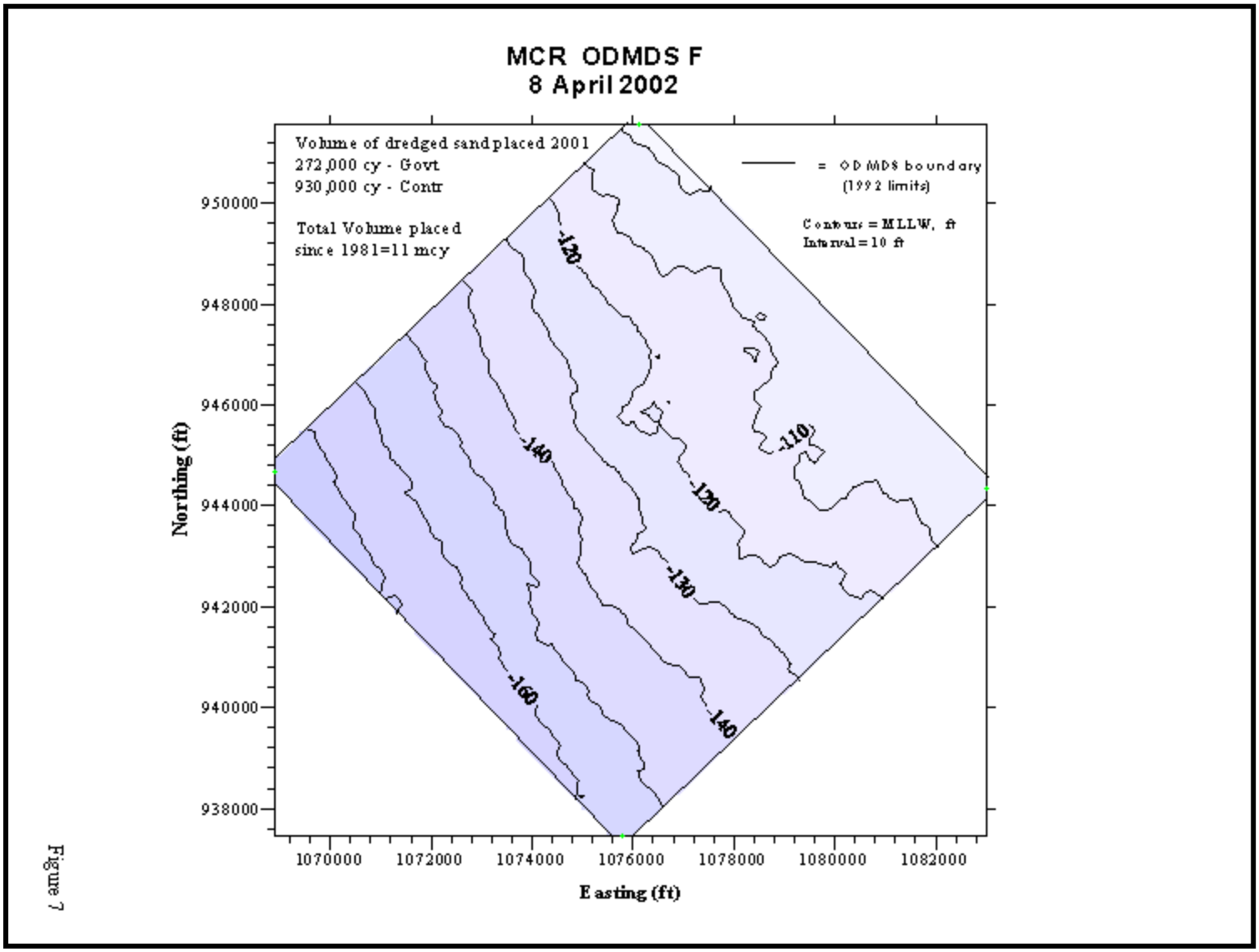
MCR ODMDS F
8 April 2002
Volume of dredged sand placed 2001
272,000 cy - Govt
930,000 cy - Contr
Total Volume placed
since 1981=11 mcy
= ODMDS boundary
(1992 limits)
Contours = MLLW, ft
Interval = 10 ft
-120
-110
-140
-130
-160
950000
948000
946000
944000
942000
940000
938000
Northing (ft)
1070000
1072000
1074000
1076000
1078000
1080000
1082000
Easting (ft)

Figure 7