Section 8

Dredging Operations and Navigational Aids

8.1 Dredging Operations

a. *Responsibility*

(1) The Transit Operations Division (OPT) is responsible for:

(a) Monitoring the condition of aids to navigation throughout the Canal, and the water depths and condition of Canal channels and anchorages, operational areas, terminal harbors and adjacent waters to ensure that they are properly maintained for the safe movement of vessels.

(b) Evaluating channels conditions and determining the priority level of the areas to be maintained, improvements and any design change required.

(c) Coordinating with the Dredging Division and the Engineering Division solutions that may develop in these areas to provide information regarding traffic scenarios and arranging operating window as much as feasible under the prevailing circumstances to allow dredging and related operations.

(d) Notifying Dredging Division (OPD), Engineering Division (IAI) and other interested parties immediately of deviations of the canal navigable conditions that could be affecting the safety of transiting vessels or other floating equipment. In that sense, will evaluate and confirm any applicable tolerances and priority level of the actions to be implemented, taking in consideration OPD's dredging plan and availability of dredge fleet.

(2) The Dredging Division is responsible for:

(a) Planning and executing dredging operations, bed leveling and disposal of dredged material from Canal navigational channels, anchorages and other operational area, in order to improve their conditions or to maintain them according to approved navigational depths and widths.

(b) Evaluating and preparing dredging plans considering OPT's requirements and the available dredging equipment. Plans and changes will be coordinated and presented to OPT for concurrence. The Dredging Division shall mobilize, deploy and execute dredging operations according the plans, and expeditiously proceed to remove any reported shoals that affect the safe navigation of vessels.

(b) Maintaining and operating navigational aids in the Canal, including anchorages and other operational areas; notifying and coordinating in sufficient time with the Canal Operations Captain (OPT's Executive Manager), or his designee, all dredging operations and with Marine Traffic Control Center (MTC) all movement of dredging equipment in Canal operating waters.

(3) The Engineering Division (Hydrography Section) is responsible for performing periodic hydrographic surveys according to the potential contribution of sediments, migration of material from the surroundings, slides or other effects; producing hydrographic charts of the navigational channel and operational waters. The Engineering Division shall timely present its evaluations and distribute these charts and reports to the Transit Operations Division and the Dredging Division for action. This applies not only for the regular maintenance/dredging program, but during the execution of capital projects in the navigational channels.

b. *Definitions*

(1) Curves: Curve is a change in direction in the navigational channel of the Canal. For the purpose of dredging, a curve extends 1,000 feet (304.8 m) in each direction from the point of intersection (PI) of the channel center line.

(2) Points of intersection in Culebra Cut and other areas of the navigation channel, please refer to the Nautical Charts (Pilot Handbook).

c. *Restrictions*

The following restrictions will be in effect when dredging equipment is stationed in Culebra Cut, Cartagena and Cocoli Reaches.

(1) For vessels not exceeding ACP visibility, dredging equipment may operate at any time in the Cut, as long as a 315-foot (96 m) channel in the straight reaches and 360-foot (109.75 m) channel in the curves, is available for one-way traffic.

(2) For vessels "Exceeding ACP Visibility", dredging equipment may operate at any time in the Cut, as long as a 347.5-foot (106 m) channel in the straight reaches and 362.5-foot (110.52 m) channel in the curves, is available for one-way traffic.

(3) For Neopanamax vessels transiting, dredging equipment are allowed to operate in the Culebra Cut reaches (including Cartagena and Cocoli reaches), as long as a 500-feet (152 m) channel in the straight reaches and 575-feet (175 m) channel in the curves, is available for one-way traffic. The curve between the reaches of Bas Obispo and Las Cascadas shall have a minimum width available of 500 feet. OPT and OPD will coordinate the installation of mooring station within Culebra Cut, Cocoli and Cartagena Reaches in order to secure the dredge, tugs and barges when traffic restrictions are applied. Auxiliary equipment (ie. Launches, tugs, etc.) is allowed to navigate during the transit of Neopanamax vessels, without restrictions.

Stationary Dredging equipment, which can maintain and hold its position (by the use of spuds, anchors, mooring buoys or other means), will be considered as an "obstruction", therefore, the area where it is located within the reach, will be declared as "way-one-traffic" for the transiting vessels, including Neopanamax and Liquified Natural Gas (LNG) classified vessel. The requirement of an escort tug to assist the transiting vessels at their pass by the dredge is at the discretion of OPT. In case that a special restriction is deemed necessary, OPT and MTC will advise OPD of such decision with ample time as to take actions, including the temporary relocation of the dredge if necessary.

(4) Other dredging equipment (ie. Trailing Suction Hopper Dredge, plow vessels) which, due to its configuration, capabilities, methodology and dredging process, needs to sail during operations, will be evaluated case by case for the interaction with Neopanamax traffic in order to establish the corresponding restrictions to operate in the navigational channels.

(5) When more than one dredging equipment is in the Culebra Cut:

(a) If more than one Dredging equipment is in the same reach, on the same side and within 1,000 feet, there is no need for extra restrictions than above (c1-c2-c3).

(b) If more than one Dredging equipment is in the same reach, on the same side and at a distance of more than 1,000 feet, the situation will be evaluated case by case in order to decide if any other restrictions are necessary.

(c) If more than one Dredging equipment is in different reaches, the situation will be evaluated case by case in order to decide if any other restrictions are necessary.

Equipment on different sides on the same reach should be avoided as much as possible. However, equipment outside of the prism line or close to the prism line can be evaluated by OPT if the distance between the two equipments is deemed adequate, and the safe passage of vessels can be completed safety.

For the navigational channels widen for the Neopanamax vessel transit, the following conditions are applicable:

i. For channels widen and placed in service to 715-feet (218 m) and 738-feet (225 m) dredging operations could be allowed maintaining a minimum clear channel width determined by OPT with a “one-way traffic” restriction.

ii. For channels widen and placed in service to 984 feet (300 m) in the Pacific and Atlantic Entrances and to 1,000 feet (305 m) in Gatun Lake (including Gamboa Reach), dredging operations are allowed, but works shall be coordinated with OPT, which will establish additional restrictions.

iii. For the intersection or junction of regular and Neopanamax channels, dredging equipment will be subject of the conditions applicable for the side on which it is located. OPT may establish additional restrictions when adjacent to channels navigated by Neopanamax channels.

(d) MTC shall document whenever dredging equipment moves on or off the center of the channel.

(e) Transit controllers should disseminate the information to all floating equipment going in or through the cut {such as ships, tugboats, launches, yachts, dredging equipment(s) etc.} of the location or movement(s) of all dredging equipment(s) in the Culebra Cut.

(f) When there is a dredge working in the navigational channels, especially in Culebra Cut, the Dredging Division will be provided with computer-generated schedules of Canal traffic.

(g) Dredging positions will be reported to MTC at the beginning of each watch. The dredge will also notify MTC before and after executing a change of position, providing all pertinent information of their exact location. The Dredge master shall be in charge of the maneuvering of the dredge during change of positioning and shall be allowed to move the dredge from the actual station to any other station in the same reach or to a station no further than 1,000 feet (305 m) in the curves.

(h) MTC will continue to relay up-to-date information on dredging equipment to all pertinent parties.

8.2 Dump Scow Movement

a. This procedure is to provide instructions for dump scow movement in the Culebra Cut (including Cartagena and Cocoli reaches). For the purpose of this part, the movement of scows (hopper barges or split barges) in the Cut will not be restricted by any other rules except those of good seamanship.

b. Movements of loaded scows by the use of a tug in the cut require previous coordination with MTC. Loaded scows will be allowed to meet vessel defined as “Clear Cut” or supers in this area on a case-by-case basis.

Loaded scows could meet any vessel that is scheduled as clear-Cut and designated as PD-1 or PD-2 in a reach, except in the areas of a reach that has not been widened and placed in service to a minimum design (715 feet or 218 m).

Meeting of Neopanamax vessels and loaded scow safely secured at a mooring station, in an approved location is permitted. Tug boat master shall report MTC when a loaded or empty scow has been secured and when the mooring station becomes vacant.

c. Movements of empty scows may be allowed to meet “Clear Cut” vessels, after coordination with MTC and the pilots of transiting vessels; however, meeting Neopanamax vessels will be evaluated on a case-by-case basis.

d. Before moving empty scows, the tow master will report the movement to MTC which will, in turn, notify the pilots of vessels which may meet the scows. Pilots of "clear-Cut" vessels will be notified of scow movements in the Cut, when they call MTC before departing Pedro Miguel northbound, or passing Gamboa southbound, or as soon thereafter as a scow movement is planned and agreed to by MTC, pilots and tug masters.

e. Pilots and tug masters will communicate with each other as necessary in order to avoid meetings in the Cut between scows and "clear-Cut" vessels in curves. A curve is defined to include 1,000 feet (304.8 m) each side of the intersection of the adjacent reaches. Tugs will yield to the "clear-Cut" vessels to avoid such meetings.

f. All differences in interpretation of rules and regulations or any departures from prescribed operating procedures must be referred to the Canal Operations Captain for resolution.

8.3 Movement of Dredging Equipment

a. Dredging equipment, being ACP equipment, is exempted of compulsory pilotage.

b. Dredging Division will be allowed to move dredging equipment as follows:

(1) Operational: Dredging equipment may move up to 1,000 feet (305 m) within a reach while engaged in dredging operations by the dredge personnel.

(2) Relocation: Dredging equipment moving more than 1,000 feet (305 m) or to another reach will require special trained personnel for this duty provided by Dredging Division. In cases that Dredging Division is unable to provide qualified personnel for the relocation, a pilot may be assigned to this duty.

8.4 Navigational Aids

a. Aids to navigation are essential for the safe and expeditious transit of ships through the Canal.

b. *Responsibilities*

(1) The Transit Operations Division is responsible for establishing the requirements for navigational aids for Canal approach and transit operations.

(2) The Vice Presidency for Engineering and Project Administration is responsible for establishing the requirements for back channel and branch channel navigational aids. The Engineering Division (Hydrography Section) is responsible for performing periodic buoys positioning and shall present its findings to the Dredging Division (Aids to Navigation). The Dredging Division is responsible for navigational aids procurement, fabrication, construction, installation, maintenance, improvement and replacement. Onsite maintenance of navigational aids is the responsibility of the Support Section of the Dredging Division.

(3) Racons installed at Canal entrances are procured by the Executive Vice Presidency for Operations and installed by the Electrical and Electronics Engineering Unit (IAIM-ELE), Electrical Division in coordination with the Dredging Division Support Section. Maintenance is the responsibility of the Electrical and Electronics Engineering Unit of the Engineering Division.

c. *Coordination*

Needs and means of improving navigational aids are coordinated between the Executive Vice Presidency for Operations and the Vice Presidency for Engineering and Project Administration. This is normally done through the Transit Operations Division, Dredging Division, and Engineering Division.

d. *Reporting Procedures*

Pilots and other personnel navigating in the Canal shall report to MTC any apparent problem of navigational aids. This includes, but is not limited to, unlit lighted aids, incorrect characteristic (RHYTHM), buoys out of position and, damaged ranges and targets. Reports shall be conveyed to the Transit Operations Division for review and action. Reports of buoys out of position shall be reported to the Engineering Division (Survey Section) to verify positioning. Duty Canal Operations Captain shall relay the information via on-line aids to Navigation Repair Request Program, Dredging Division,

and verify if information was received by contacting the Gamboa Field Office using the hot line between the two offices. Information shall include:

(1) Buoys: Position number, reach name, ship's transit number (northbound or southbound), and date observed.

(2) Ranges: Reach name, ship's transit number (northbound or southbound), date observed, and if upper, middle or lower range. Culebra Cut range targets shall specify whether it is the sailing line or the centerline.

(3) Sector Lights: Reach name, vessel transit number (Northbound or Southbound) and date observed.

(4) Bank Lights: Reach name, ship's transit number, date observed, if east or west, and if north, middle or south of the reach.

(5) Racons: Operational status of Racons is made by Electrical and Electronics Engineering Unit (IAIM-ELE) in coordination with Signal Station staff. Signal Station staff will obtain from the ship's crew information on effectiveness of Racon signal on the ship's radar receiver. Information to Electrical and Electronics Engineering Unit (IAIM-ELE) will include ship's Racon response on X/S bands and signal definition and strength.

(6) Mamei Curve: Mamei Curve is divided into two reaches; namely, Juan Grande Reach and Mamei Reach. When reporting outages in this area, pilots should refer to the specific reach, not to the curve.

8.5 Range targets and sector lights in Culebra Cut

a. There are four pairs of range targets in every reach in Culebra Cut and the navigational channels of the Panama Canal as aids to navigation for north and southbound vessels – two pairs for the center line and two pairs for the sailing line. An exception are the Pacific Entrance that does not have southbound ranges, and only centerline northbound ranges only, and the Atlantic Channel that is fitted with centerline southbound ranges only and is not equipped with northbound ranges.

b. The range targets are white rectangular boards, each 12 feet wide by 20 feet long, for the longer reaches, which are 12 feet wide by 30 feet long. The range targets that mark the center line have a black cross, while the range targets that mark the sailing line have one vertical line in the center.

c. The range lights are an extended light source measuring from 16 to 28 feet. The range lights for the center line are yellow, while the range lights for the sailing line are green. The forward range lights are fixed lights, while the rear range lights are occulting lights (3.5 seconds).

d. In addition, new sector lights have been installed on the rear structure of the range targets that mark the sailing line. Sector lights are on day and night and show different colors (flashing red, fixed red, white/red, white, white/green, fixed green, flashing green) that vary according to the position of the vessel. It must be noted that the green color is always on the right, and the red color on the left, whether the vessel is northbound or southbound. The new sector lights, as shown below, mark the center of the sailing lines. The white sector of the sector lights has a maximum width of 40 ft (20' on each side of the sailing line) at the furthest part of the reach.

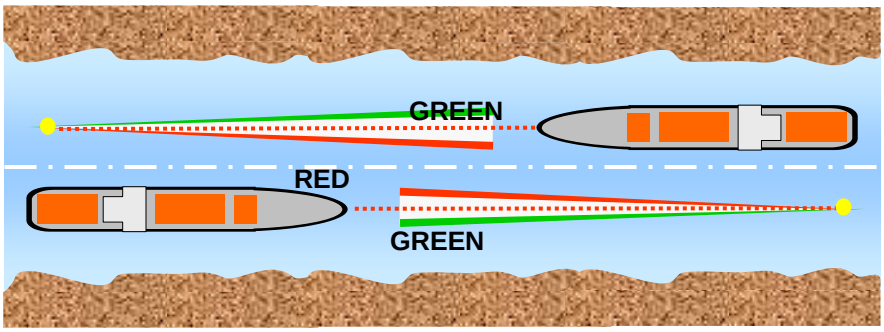

FIGURE 1 – New Sector Lights or PEL Lights