CIA/SC/RR 72

11 June 1954

Dissemination Authorized
Assistant Director
Office of Current Intelligence

No. Pages - 31
Copy No. -

11810

PETROLEUM SHIPMENTS ON THE CASPIAN SEA

Office of Research and Reports

CENTRAL INTELLIGENCE AGENCY

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CIA/SC/RR-72

PETROLEUM SHIPMENTS ON THE CASPIAN SEA*

Summary

The Caspian Sea serves as a vital link in the Soviet system for the distribution of petroleum. Important sources of crude oil are located on both sides of the Sea, including the most important single producing area, Baku. In addition, the largest Soviet refinery complex is located at Baku, and other refineries are located at Krasnovodsk and Gur'yev and at Groznyy, which imports and exports through the port of Makhachkala. It is estimated that approximately 12 million to 12.5 million tons** of crude oil and petroleum products are carried annually on the Caspian Sea.

Petroleum shipping is handled by the Caspian State Petroleum Shipping Company (Kasptanker) as far north as the 14-foot roadstead, which is 70 miles south of Astrakhan'. Shipments north of the roadstead are handled by the Astrakhan' State Roadstead Petroleum Shipping Company (Reydtanker). The annual carrying capacity of the tankers and large barges that transport petroleum on the Caspian Sea is estimated to be at present about 13.1 million tons. One small tanker is known to have been added to the fleet since 1948.

Terminal storage facilities are located in five of the Caspian ports. The largest storage capacity, 3.5 million tons, is located at Baku, the principal producing, refining, and shipping point. Petroleum storage facilities at Astrakhan', the principal transshipping point, amount to about 1.8 million tons. Storage facilities at the other three ports are considerably less in accordance with the volume of traffic. The storage capacity at Krasnovodsk is 800,000 tons; at Makhachkala, 900,000 tons; and at Gur'yev, 75,000 tons.

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* The estimates and conclusions contained in this report represent the best judgment of the responsible analyst as of 15 May 1954.

** Tonnages throughout this report are given in metric tons.

Finished petroleum products are shipped from Baku to Astrakhan', Makhachkala, and Krasnovodsk; from Makhachkala to Astrakhan'; and from Krasnovodsk to Astrakhan' and Makhachkala. Crude oil and semifinished petroleum products are shipped from Baku to Makhachkala, Astrakhan', and Gur'yev and from Krasnovodsk to Makhachkala, and Gur'yev. Crude oil is shipped from Astrakhan' to Makhachkala and occasionally from Krasnovodsk to Baku.

In 1948 an estimated total of 10,165,000 tons of petroleum were transported on the Caspian Sea, of which approximately 9,065,000 tons (89 percent) were shipped from Baku, 800,000 tons (8 percent) from Krasnovodsk, and 300,000 tons (3 percent) from Makhachkala. Since 1948, shipments of Tuymazy crude oil going down the Volga River to Astrakhan' and from there to Makhachkala have become a part of the shipping pattern, and shipments from Krasnovodsk have undoubtedly increased as a result of the growing surplus of crude oil in that area. It is believed that, with these increases, the present volume of shipping is between 12 million and 12.5 million tons. Baku has undoubtedly maintained its position as the predominant shipping point, and Astrakhan', its position as the principal receiving point.

I. Introduction.

The Caspian Sea is a vital link in the transportation system of the USSR, not only because of its strategic location but also because of the inadequacy of the rail network around it. In addition, the cost of water transport per ton-kilometer is about one-fifth as much as the cost of rail transport. 1/* Because approximately 35 percent of the petroleum in the USSR is produced in the area of Baku, the Caspian Sea transport lanes are of particular importance in transporting petroleum. The better quality products such as aviation gasoline, aviation

* Footnote references in arabic numerals are to sources listed in Appendix E.

oil, jet fuel, and some special lubricating oils are usually transported by rail, although the major portion of the remaining petroleum is shipped from Baku by sea.

Approximately two-thirds of the total Soviet tanker tonnage is located in the Caspian Sea. 2/ The Caspian tanker fleet is considerably augmented by the use of oil barges, some of which have a capacity of over 4,000 tons. As of January 1954, 80 tankers and at least 6 large barges have been observed in operation on the Caspian Sea, with an estimated total potential carrying capacity of 281,597 tons (see Appendix A). In addition to the carrying capacity of the fleet, there is a large volume of terminal storage capacity that is used in the transshipment of petroleum.

Baku is a major center both for the production of crude oil and for refining. It ships crude oil to Makhachkala, for the Groznyy refinery, and topped crude oil to Gur'yev for the Lend-Lease Houdry catalytic cracking unit there. It ships finished petroleum products to Astrakhan', Krasnovodsk, and Makhachkala for distribution throughout the USSR.

Astrakhan' is located on the Volga River estuary at the northern end of the Caspian Sea. It is a port through which finished and semi-finished petroleum products pass from Soviet refineries in the south for consumers in European USSR. The products received at Astrakhan' by sea are transshipped by barge up the Volga River, by pipeline to Saratov, and by rail. Some Tuymazy crude oil, from the Ural-Volga (Second Baku) area, is shipped out of Astrakhan' by sea to Makhachkala for the Groznyy refinery. In spite of being icebound from the end of November to the first part of April, Astrakhan' is the most important petroleum transshipment point in the USSR.

Krasnovodsk is on the east coast of the Caspian Sea, almost directly across from Baku. Through this port pass finished petroleum products going from Baku to Soviet Central Asia, Siberia, and the Soviet Far East. Products from the Krasnovodsk refinery are shipped by sea to Makhachkala and Astrakhan'. Crude oil from Turkmen SSR and from the Termez area is shipped from Krasnovodsk to Makhachkala for the Groznyy refinery. Also, occasional shipments of crude oil have been sent to Baku and to Gur'yev.

Makhachkala is located on the west coast of the Caspian Sea, between Baku and Astrakhan'. It serves as a terminal for receiving crude oil by sea and for shipping it on by pipeline to the Groznyy refinery. It also receives finished petroleum products from Baku and Krasnovodsk and transships them by rail to northern points, particularly in the winter, when the port at Astrakhan' is closed. Some refined products are shipped out of Makhachkala to Astrakhan' and occasionally to Krasnovodsk.

Gur'yev is located on the Ural River, approximately 13 miles from the river estuary, at the northern end of the Caspian Sea. Because Gur'yev is a shallow-water port, petroleum arriving there by sea is unloaded at Peshnoy Island, 18 miles from Gur'yev, and sent the rest of the way by pipeline. Topped crude oil from Baku is received in this manner for the Lend-Lease Houdry catalytic cracking unit there. Some crude oil is also received from Krasnovodsk.

Approximate distances between the petroleum ports are shown below in nautical miles. 3/

From	To: Baku	Astrakhan'	Gur'yev Astrakhan' Roadstead	Gur'yev Terminal*	Krasnovodsk	Makhachkala
Baku		573	503	867	206	255
Astrakhan'			70			
Astrakhan' Roadstead				364	660	248
Gur'yev Terminal*					1,024	612
Krasnovodsk						420
Makhachkala						

II. Conditions of Navigation on the Caspian Sea. 4/

A study of the movement of petroleum on the Caspian Sea requires that certain characteristics of the Sea be considered insofar as they affect navigation. The Caspian Sea is in reality a large inland lake fed by numerous rivers and having no outlet for its waters other than by evaporation. In the past the level of the Sea has fluctuated greatly and in recent years it has been falling steadily. In addition, there is alluvial deposition at the mouths of the rivers that feed the Sea. These two

* Peshnoy Island, 18 miles from Gur'yev.

conditions present serious problems in maintaining deep-water navigation and in keeping the harbors open. Extensive dredging operations are frequently necessary in the port areas.

The sea has the following three distinct sectors: the northern sector, which occupies the area north of 44° North and is very shallow, having an average depth of about 21 feet; the central sector, which is between 40° North and 44° North, has an average depth of about 550 feet, and is the chief area of operation for Kasptanker; and the southern sector, which is the deepest, having an average depth of about 1,072 feet. An important consideration in Caspian Sea navigation is the fact that the entire northern sector is icebound from about the end of November until the first part of April. At the height of winter the icebound area extends almost as far south as Makhachkala, and, in extremely cold winters, ice has formed in the harbors of both Makhachkala and Krasnovodsk, although neither of these ports is classified as icebound. Both Gur'yev and Astrakhan are classified as icebound and are closed for a period of 4 to 5 months. In 1952, however, the channel from Astrakhan Roadstead to Astrakhan was forced open on 1 March by icebreakers.

In addition to the falling sea level and the ice formation, two other conditions influence navigation, namely the changes in water depth caused by prolonged winds from one direction and the currents set up by wind action. Daily weather information is broadcast to all vessels.

III. Transportation Companies of the Caspian Sea

Petroleum shipments on the Caspian Sea are handled by the Caspian State Petroleum Shipping Company (Kasptanker) and the Astrakhan State Roadstead Petroleum Shipping Company (Reydtanker). 5/ These organizations were established in 1923, when the then existing Caspian Steamship Company was reorganized into the following three independent steamship companies: Kaspflot (the dry-cargo fleet), Kasptanker, and Reydtanker. A division of responsibilities between Kasptanker and Reydtanker is necessitated by navigation conditions.

Kasptanker has its headquarters at Baku, on pier 44, in the center of the oil pier area "Neftegavan." It has regional offices at Makhachkala, Krasnovodsk, Ufra, Apsheron Port (on the east end of the Apsheron

Peninsula) and at the 14-foot roadstead. Its tankers take petroleum shipments as far as the 14-foot roadstead, 70 miles south of Astrakhan', which is as far as seagoing tankers can go. 6/ In an agreement signed in March 1949, Kasptanker attempted to limit its responsibility to operation in a roadstead of a depth of 18 feet and Reydtanker, in depths of less than that. 7/ Kasptanker also carries petroleum between Baku, Krasnovodsk, and Makhachkala. It operates deep-draft tankers; large barges, some of which are self-propelled; and some tugs.

Reydtanker has its headquarters in Astrakhan'. Its fleet, consisting of tugboats, barges, and a few tankers, forwards finished and semi-finished petroleum products from the 14-foot roadstead to Astrakhan', Gur'yev, and occasionally to Makhachkala. A steel ship, the Donbass, is used as the control point for the transshipping operations at the 14-foot roadstead and is anchored there during the navigation season (from about the middle of March to the middle of November). 8/ The primary function of this base is to insure the safe arrival of the cargo and the steady and uninterrupted loading and unloading of cargo. Reydtanker's barges tie up on both sides of each tanker that is to be unloaded, and the cargo is transferred by means of hoses and pumps installed on the tanker. The barges then carry the petroleum to the storage areas in Astrakhan' for further distribution to the north or to Gur'yev. 9/

Transport from Baku to Gur'yev is carried out in four stages. Kasptanker takes the cargo to the 14-foot roadstead, where it is transferred into 5,000-ton barges of Reydtanker. The barges are towed to the Gur'yev roadstead, about 10 miles south of Peshnoy Island. There the cargo is transferred to 800-ton barges, also belonging to Reydtanker, which go into the terminal at Peshnoy Island. From Peshnoy Island the cargo is sent by pipeline to Gur'yev.

The present estimated carrying capacity of the petroleum transportation fleet in the Caspian Sea is 281,597 tons (see Appendix A). This estimate is based on the inclusion of all tankers observed in operation on the Caspian Sea since 1947 plus the inclusion of several large barges which are believed to be used in regular transportation operations rather than in transshipping operations. Of the 80 tankers listed in Appendix A, 17 have not been observed in operation since 1950. Although most of these tankers are about 50 years old they have been included in the total estimate as representing potential carrying capacity. One small tanker,

the Ukhta, which was recently constructed in Sweden, went into operation on the Caspian Sea in September 1953. 10/ The recently observed Gorokhovets is also believed to be a new tanker although no information is available. Because of the great need for tankers in other areas of the USSR, it is interesting that at least 1 and possibly 2 new tankers have been sent to the Caspian Sea. The General Aziaslanov is a converted tanker that was returned to service after the installation of a diesel-electric power system in 1948. 11/

The tankers listed vary in size from about 500 to 6,500 gross tons. About 75 percent of them are less than 2,000 gross tons. The barges have a carrying capacity of between 4,000 and 5,000 tons each.

In 1948 a total of 295 tanker shipments of finished petroleum products from Baku were observed on 84 days. 12/ A total of 36 tankers were engaged in making these shipments. Of the total observed shipments, 184 were made on 12 tankers -- that is, one-third of the tankers made over 60 percent of the trips. In general it has been observed that the major portion of the shipments is carried by a small percentage of the available tankers.

Kasptanker does not designate a certain type of cargo to be carried exclusively by individual tankers. A few small tankers appear to be used largely for transporting lubricating oil, but even this practice is not strictly maintained. This is probably because of difficulty in having tankers available where they are needed and because the composition of petroleum shipments may vary from month to month. The tankers frequently have to switch from hauling dirty products (for example, crude oil, mazut, and lubricating oils) to clean products (for example, gasoline and kerosene). This necessitates steaming the tanks between trips.

IV. Loading and Storage Facilities at the Caspian Sea Ports.

A. Baku. 13/

The Baku harbor is a crescent shaped bay about 4.5 miles wide. The eastern central part is backed by a 60 foot cliff, and the southern part, by an alluvial plain. There is extensive anchorage in the roadstead, which is sheltered from all winds.

The petroleum piers are located in the central part of the waterfront, covering a space of approximately 4 miles. This area is known as Neftegavan. There are 29 piers, varying in length from 270 to 800 feet and varying in width from 25 to 75 feet. Water depth alongside varies from 12 to 20 feet. Extensive dredging operations are carried on in the Baku harbor to keep the piers and the approaches to the piers clear and open to navigation. 14/

The storage facilities for bulk petroleum, in the Baku area, are the largest of any of the Caspian Sea ports. There are many tanks and many open storage pits in the waterfront area, some of which are used as terminal storage and some by refineries. There are about 150 tanks and 25 open pits that are believed to be used for terminal storage. These tanks range in size from 45 to 105 feet in diameter, and the pits range from 1,500 to 6.1 million square feet (140 acres). It is believed that each group of tanks is served by rail spur and by pipeline, but it is doubtful that all pits are served by rail.

New tanks have been constructed at Baku as recently as the autumn of 1952. Many of these tanks are for refinery use. 15/

Construction of new oil bases in the Baku area during 1950-52 but there is no definite information on actual construction. 17/

It is estimated that the total terminal storage capacity is approximately 3.5 million tons, 19/ as shown in Table 1.*

B. Astrakhan'. 20/

The city of Astrakhan' is located on an island in the Volga River estuary. There is no anchorage at the port itself, but there is extensive anchorage at the 14-foot roadstead, approximately 70 miles out to sea. There is unlimited anchorage at the 16-foot roadstead which is approximately 13 miles farther out to sea.

* Table 1 follows on p. 9.

Table 1

Estimated Petroleum Storage Capacities at Caspian Sea Ports

	Thousand Metric Tons
Baku	3,500
Astrakhan'	1,800
Krasnovodsk	800
Makhachkala	900
Gur'yev	75
Total	7,075

The petroleum piers and the petroleum storage terminals are located along both banks of the river, extending both north and south of the city for a total distance of about 17 miles. The barges are moored at piers and wharves. In all cases tankers and barges are moored parallel to the river. It is believed that water depth alongside the wharves averages 18 feet. Dredging is necessary in order to maintain a channel to the roadstead from the port.

The storage facilities for bulk petroleum, at Astrakhan', are the second largest in the Caspian Sea area. All the bulk storage capacity at Astrakhan', both tank and open pit, is terminal storage. The northernmost terminal and at least one other terminal are served by rail. There is a total of about 110 tanks, above ground and underground, ranging in size from 20 to 100 feet in diameter. There are 35 to 40 pits, ranging in surface area from 28,000 to 140,000 square feet. It is estimated that the total shore storage capacity is approximately 1.8 million tons, 21/ as shown in Table 1.

C. Krasnovodsk. 22/

The Ufra harbor, in the port of Krasnovodsk, is the petroleum terminal for Krasnovodsk. It is located on the east end of Muraview Bay and is connected with deep water by a dredged channel over 2 miles

long and 300 feet wide. Lightering facilities are necessary for loading the larger tankers, because of the constant lowering of the water level of the Caspian Sea. There are six piers, but no quays. Beginning with the northernmost pier, the third, fourth, and fifth piers from north to south are equipped for handling bulk petroleum. The third pier is approximately 790 feet long and is served by pipeline and rail. The fourth and fifth piers, one-half mile south of the third pier, are each 655 feet long and are served only by pipeline.

Captured German aerial photographs of the Ufra terminal and the Ufra harbor show that in 1942 the piers were each able to take four tankers or barges alongside at a time. It is apparent that no bombing damage occurred to the piers or to the terminal during World War II. 23/

The harbor on the west end of Muraview Bay is known as Western Harbor. The city of Krasnovodsk is located there, with the Krasnovodsk refinery about 2 miles to the north. There are no oil-handling piers in this harbor. Western Harbor and the Ufra harbor are about 3 miles apart but are not directly connected. They are approached over a course from the south. This course originates at the Krasnovodsk Lightship, located at the entrance to Krasnovodsk Gulf. 24/

The Ufra storage terminal extends from the third pier easterly and northeasterly for approximately 1 - 1/4 miles. There are 61 tanks at this terminal, ranging from 20 to 80 feet in diameter and from 20 to 37 feet in height. There are 8 pits 600 feet long by 150 feet wide, and 1 pit 950 by 325 feet. The installation is served by a spur from the Ashkhabad railroad. The estimated storage capacity is approximately 536,000 tons. 25/

Information from interrogation reports states that in 1948, 8 new pits approximately the same size as the then existing 8 small pits were under construction. This would provide an additional storage capacity of about 257,000 tons. 26/
a new "Oil Base" was planned at Ufra. 27/ There is no information, however, on the amount of new storage space constructed. The known total tank and open pit capacity for the storage of petroleum at Ufra terminal is estimated to be approximately 800,000 tons, as shown in Table 1.

D. Makhachkala. 28/

At Makhachkala, there are two harbors that are approximately 2 - 1/4 miles apart. The coast to the north is backed by low flat land and to the south by gentle slopes and cliffs. At the city of Makhachkala the coastline makes a sweeping bend.

The northernmost harbor is the petroleum harbor, although petroleum is also handled in the main harbor. A 700-foot pier extends into the sea in the northern harbor. This pier is protected by an 1800-foot-long breakwater that is parallel to the shoreline and is approximately one-half mile offshore. This pier is reached by pipeline but not by rail. 29/

The main harbor is composed of a mole extending three-fourths of a mile into the sea at an angle of 45° to the shoreline and it forms the sea protection on the eastern side. The northern side is protected by a quay extending about 1,500 feet into the sea, leaving an entrance space on the northern side. This quay is considered the fueling quay in this harbor. It has both a pipeline and a railroad. 30/

There is deep water at both these harbor facilities, but dredging operations are conducted occasionally to insure sufficient depth of water in the basin and at the fuel docks. Captured German aerial photographs show that, in 1942, tankers and barges were able to go alongside both sides of the petroleum pier in both harbors, if necessary. It is possible that tankers could go two abreast alongside the pier in the petroleum harbor.

The principal facilities for storage of bulk petroleum are located in the vicinity of the petroleum harbor and extend inland from the pier in a northwesterly direction. There are 73 tanks at this terminal, ranging in diameter from 40 to 110 feet, and 2 pits with a total surface area of about 1,238,000 square feet. This area is the Caspian Sea terminal of the pipeline to the Groznyy refinery.

It is estimated that the storage capacity in this vicinity is approximately 735,000 tons.

In the vicinity of, and on, the quay at the main harbor facilities there are about 12 tanks ranging in size from 50 to 90 feet in diameter

and having an estimated capacity of about 50,000 tons. At the site of a former refinery, 1 mile directly west of the main harbor facility there are located 16 storage tanks, ranging in size from 35 to 100 feet in diameter. It is assumed that these tanks are now used for terminal storage.
at least 30,000 tons of new storage capacity were accepted for use at Makhachkala at that time. 32/ This involved a minimum of nine tanks.

It is estimated that the total tank and pit storage capacity, including the tanks constructed in 1948, is approximately 900,000 tons, 33/ as shown in Table 1.*

E. Gur'yev, 34/

The harbor for Gur'yev is located on Peshnoy Island, one of a group of low, flat islands about 5 miles offshore from the Ural River estuary. A canal connects Gur'yev with the Caspian Sea, but apparently only the shallowest barges can navigate it. There is no anchorage at Gur'yev proper, and what anchorage there might be at Peshnoy Island would be very insecure because of the variation of the sea level caused by wind pressure and because of the shallowness of the sea itself. Extensive dredging is necessary to maintain a reasonable flow of petroleum to Peshnoy Island. The only information regarding the piers at Peshnoy Island is from a captured photograph that shows what appears to be a pier with one side clear for barges. 35/ A pipeline with a capacity of 4,000 tons per day carries crude oil from Peshnoy Island to the Gur'yev refinery. 36/

The bulk petroleum storage facilities at Gur'yev are located on the east bank of the Ural River, south of Gur'yev. There are believed to be 17 tanks ranging in size from 25 to 80 feet in diameter and one pit of approximately 100 square feet.
It is estimated that the storage capacity is approximately 55,000 tons.

there were approximately 19,000 tons of storage capacity on Peshnoy Island at that time. 38/ The total combined storage capacity at Gur'yev and Peshnoy Island is estimated to be approximately 75,000 tons, as shown in Table 1.*

* P. 9, above.

V. Petroleum Shipments on the Caspian Sea.

The general pattern of shipments of petroleum on the Caspian Sea is characterized by a major movement away from Baku (see map*). The area around Baku is the largest producer of crude oil in the USSR, and the refinery complex consists of the largest aggregation of refining facilities in the country. Because of the facts that rail facilities leading out of Baku are not extensive and that the port of Baku is normally open throughout the year, the Caspian petroleum fleet provides transportation, from Baku, for the major portion of the crude oil, finished petroleum products, and semifinished petroleum products that are destined for other areas. The more valuable finished petroleum products, such as aviation gasoline, jet kerosene, and special oils, are usually transported by rail while crude oil and semifinished petroleum products are moved primarily by water or pipeline.

A. Shipments from Baku.

Considerable information is available on planned and actual shipments of petroleum from Baku to other ports on the Caspian Sea in 1948.

The Oil Sales Office in Baku reports on the shipment of finished petroleum products, and the Baku Oil Transport Office reports on the shipments of crude oil and semifinished petroleum products.** The semifinished petroleum products are considered to represent charge stock for other refineries and to include such products as straight-run mazut, gas oil, and mixed oils. The information on shipments which is covered in this section is broken down according to the two headings, Finished Petroleum Products and Crude Oil and Semifinished Petroleum Products.

1. Finished Petroleum Products.

More than 50 percent of the finished petroleum products shipped from Baku in 1948 is estimated to have been shipped to Astrakhan'

* For the origins and destinations of total shipments of petroleum on the Caspian Sea in 1948, see the map, which follows p. 24.

** Both the Oil Sales Office and the Baku Oil Transport Office now report to the Chief Directorate of Oil Sales in Moscow, although the Baku Oil Transport Office formerly reported to its own Chief Directorate, within the Ministry of the Petroleum Industry.

during the 8 months in which shipping to that port is possible. Shipments of more than 1 million tons of finished petroleum products from Baku to Astrakhan in 1948 are shown in Appendix B by type of product and by month of shipment. Although the finished products shipped represent almost every type normally produced by the Baku refineries, about 45 percent of the total consisted of tractor kerosene. The percentages of other individual products were each less than 10 percent of the total. Although the shipping season at Astrakhan was closed by 14 December 1948 and the last shipment to Astrakhan left Baku on 7 December 1948, a few sporadic shipments during January and March of 1948. 39/ These may have been occasioned by unseasonably warm weather conditions of brief duration. Shipments for the other 8 months range from 83,044 tons for 6 days in July 1948 to 159,477 tons for 8 days in April. Normally shipping would be expected to be high in April, because of the opening of the navigation season, and it could be expected to vary, in other months, with the agricultural requirements and with the available storage and transshipment facilities. The average daily shipments for April through November, together with the estimated monthly shipments, are shown in Table 2. *

The total shipment of finished petroleum products from Baku to Astrakhan in 1948, including occasional shipments during the 4 off-season months, is estimated to have been about 3.6 million tons.

Very good information is available, however, for April 1949. 40/ 9 days in April 1949 show an average daily shipment of 191,984 tons, or an estimated total shipment for the month of nearly 600,000 tons. This figure is in very good agreement with the figure for April 1948 (see Table 2)

Baku has continued to ship the same types of products with no significant changes. 41/

Finished petroleum products are also shipped from Baku to Makhachkala and Krasnovodsk.

* Table 2 follows on p. 15.

Table 2

Estimated Caspian Sea Shipments of Finished Petroleum Products from Baku to Astrakhan'
April-November 1948

Metric Tons

Month	Average of Daily Shipments	Monthly Shipment a/
April	19,935	598,050
May	14,599	437,970
June	20,484	614,520
July	13,841	415,230
August	14,024	420,720
September	10,628	318,840
October	11,522	345,660
November	11,173	335,190
Total		3,486,180

a. Obtained by multiplying the average of daily shipments by the number of days in the month.

Shipments to Krasnovodsk during this period included most of the products normally produced by the Baku refineries, with the exception of motor gasoline and mazut, of which Krasnovodsk has a surplus.* The first noted shipment of jet fuel from Baku to Krasnovodsk occurred in April 1949, and other shipments of it in 1950 and 1951.42/ Using the average of daily shipments and the monthly plans, it is estimated that approximately 1.3 million tons of finished petroleum products were shipped from Baku to Krasnovodsk in 1948. Information for the first quarter of 1949 appears to indicate that shipments for that year remained at about the same level. Information for subsequent

* See Table 4, on p.

years is insufficient for estimates. It is believed that shipments have remained at about the same level, although the increasing importance of Soviet Central Asia as a producer of crude oil and both finished and semifinished petroleum products 43/ raises the possibility that shipments to Krasnovodsk may have decreased somewhat.

Shipments from Baku to Makhachkala in 1948 and in the first quarter of 1949 also included most of the finished petroleum products produced at Baku, with the exception of motor oil and nigrol. The only references to shipments of aviation gasoline from Baku to Makhachkala are [redacted] shipment planned for January 1949 and [redacted] shipment in February 1949. 44/ Presumably this product is not shipped regularly. [redacted] it is estimated that the total shipment for 1948 amounted to about [redacted] million tons. This figure is believed to contain a seasonal variation with a marked increase in shipments during the period when the port of Astrakhan' is closed. 45/

2. Crude Oil and Semifinished Petroleum Products.

Shipments of crude oil and semifinished petroleum products from Baku go to Makhachkala and Gur'yev to supply the refineries at Groznyy and Gur'yev. They also go to Astrakhan', presumably for transshipment to points further north and, in some instances, for transshipment from Astrakhan' to Gur'yev. 46/

Very good information is available for 1948 and 1949 on the shipments of crude oil and semifinished petroleum products from Baku to Makhachkala, Gur'yev, and Astrakhan'. 47/

Estimates for these 2 years by type of crude oil and by type of semifinished petroleum product are presented in Table 3.* These estimates are based on an assumed shipping period of 360 days per year to Makhachkala and of 240 days per year to Astrakhan' and Gur'yev. All semifinished petroleum products other than gas oil are considered as mixed oils because the term is believed to include straight-run mazut as well as other semifinished petroleum products. 48/ In 1949 a small quantity of mixed Kala crude oil and gas-oil was sent to Gur'yev and has been included in the estimates for the two individual products.

* Table 3 follows on p. 17.

Table 3

Estimated Caspian Sea Shipments of Crude Oil and Semifinished Petroleum Products from Baku to Makhachkala, Astrakhan', and Gur'yev 1948 and 1949

Thousand Metric Tons

Item	Destination			
	Makhachkala	Astrakhan'	Gur'yev	Total
1948				
Artem Crude Oil	490	190		680
Karachukhur Crude Oil	500			500
Kala Crude Oil		30	445	475
Gas Oil			270	270
Mixed Oils				940
Total	1,790	360	715	2,865
1949				
Artem Crude Oil	450	130	70	650
Karachukhur Crude Oil	390			390
Kala Crude Oil			275	275
Gas Oil			260	260
Mixed Oils	725	125		850
Total	1,565	255	605	2,425

The observed decrease in 1949 shipments seems to have been caused primarily by a decrease in shipments of crude oil. This decrease could have been the result of poor production of crude oil in Azerbaydzhan in 1949. Since 1949, available evidence has been insufficient for making yearly estimates, but there is evidence that the shipments have increased.

Shipments from Baku to Makhachkala in 1948 and 1949 consisted of Karachukhur crude oil, Artem crude oil, and mixed oils. The shipments did not decrease appreciably in 1949. 49/ Information for the first quarter of 1950, and for other months in 1950 and 1952, indicates that the monthly transport of Karachukhur crude oil to Makhachkala has continued to range between 35,000 and 40,000 tons per month. 50/ In addition, the planned shipment of straight-run mazut in July 1952 was about 50,000 tons. 51/ Shipments of Gyurgyany crude oil were observed in March and May of 1950. 52/ but have not been observed since. No information is available on shipments of Artem crude oil since May 1950. Although the evidence is not conclusive, it is believed that shipments of crude oil and semifinished petroleum products from Baku to Makhachkala are maintained at the level of approximately 1.7 million tons per year.

Shipments to Gur'yev in 1948 consisted only of Kala crude oil and gas oil. In 1949 a considerable drop in the shipment of Kala crude oil was partially offset by shipment of Artem crude oil to Gur'yev. Since 1949, other shipments of Artem crude oil have been observed, as well as shipments of diesel fuel distillate to be used as charge stock for the refinery, while shipments of gas oil and Kala crude oil have continued. 53/

Shipments to Astrakhan' during 1948-50 consisted of Artem crude oil and mixed oils, including straight-run mazut, and a small shipment of Kala crude oil in 1948. 54/ Since 1950, Baku has continued to ship Artem crude oil and since 1951 several shipments of pyrolytic charge stock have also been noted. 55/ The estimated totals of all sea shipments from Baku in 1948 and 1949 are shown in Table 4. *

B. Shipments from Krasnovodsk

Although Krasnovodsk receives a wide variety of finished petroleum products from Baku by sea, it ships motor gasoline and heating mazut, as well as straight-run mazut and crude oil, back across the Caspian Sea to Astrakhan' and Makhachkala. A fair amount of information is available on planned and actual shipments in 1948. Motor gasoline and heating mazut appear to be shipped regularly to Astrakhan' during the navigation season, with crude oil sometimes being sent in place of heating mazut. 56/ During the winter months, when Astrakhan' is closed, heating mazut is shipped to Makhachkala. The December

* Table 4 follows on p. 19.

Table 4

Estimated Caspian Sea Shipments of Petroleum from Baku to Makhachkala, Astrakhan', Krasnovodsk, and Gur'yev 1948 and 1949

Thousand Metric Tons

Destination	1948	1949
Makhachkala		
Finished Petroleum Products	1,300	1,300 a/
Crude Oil and Semifinished Petroleum Products	1,790	1,565
Total	3,090	2,865
Astrakhan'		
Finished Petroleum Products	3,600	3,600 a/
Crude Oil and Semifinished Petroleum Products	360	255
Total	3,960	3,855
Krasnovodsk		
Finished Petroleum Products	1,300	1,300
Crude Oil and Semifinished Petroleum Products		
Total	1,300	1,300
Gur'yev		
Finished Petroleum Products		
Crude Oil and Semifinished Petroleum Products	715	605
Total	715	605
Total Finished Petroleum Products	6,200	6,200 a/
Total Crude Oil and Semifinished Petroleum Products	2,865	2,425
Grand Total	9,065	8,625

a. Derived solely on the assumption that the estimated shipment for 1948 held true for 1949 also.

shipping plan to Makhachkala included motor gasoline, 57/ but this is not believed to be a regular occurrence.

The total sea shipments of finished products from Krasnovodsk in 1948 are estimated as follows: 375,000 tons of heating mazut and/or crude oil and 110,000 tons of motor gasoline to Astrakhan' and 125,000 tons of heating mazut and 15,000 tons of motor gasoline to Makhachkala.

Available evidence indicates that straight-run mazut is shipped fairly regularly from Krasnovodsk to Makhachkala for the Groznyy refinery. 58/ In addition, crude oil is occasionally shipped for the Groznyy refinery. 59/ It is estimated that 150,000 tons of straight-run mazut and 25,000 tons of crude oil were shipped to Makhachkala in 1948.

The total sea shipments from Krasnovodsk in 1948 are estimated to be 800,000 tons. The information after 1948 is insufficient for an estimate. The pattern established in 1948, however, is believed to have been followed, with a probable increase in shipments of crude oil to Makhachkala and Baku and occasional shipments of topped crude oil to Gur'yev. 60/

C. Shipments from Makhachkala.

Available information on sea shipments out of Makhachkala is very limited, although it is known that Makhachkala has shipped finished products to Astrakhan' and Krasnovodsk. No crude oil or semifinished petroleum products are shipped by sea.

Two monthly plans in 1947 indicate shipments of 20,000 and 25,000 tons of lamp kerosene to Astrakhan', 61/ and the monthly plan for sea shipments during June 1948 called for shipment of 8,000 tons of aviation gasoline, type B-70, and 12,000 tons of lamp kerosene, also to Astrakhan'. 62/ the May plan of transport by sea (destination unspecified) of 33,000 tons consisting of ligroin lamp kerosene, diesel fuel, and mazut.

shipments to Astrakhan', including transfers of State Reserves. 64/ Shipments of aviation gasoline to Krasnovods in November 1950 and February 1951, 65/ apparently were not part of a regular plan.

Although available information is obviously insufficient for an estimate of shipments from Makhachkala, it is believed that total annual shipments during 1948-50 did not exceed 500,000 tons and probably were about 300,000 tons. These shipments consisted entirely of finished products and were shipped principally to Astrakhan'. No conclusions can be drawn for the period after 1950.

D. Shipments from Astrakhan'.

Very little evidence is available on sea shipments out of Astrakhan'. Shipments of Tuymazy crude oil to Makhachkala for the Groznyy refineries have been observed since 1949. 66/ The Tuymazy crude oil is believed to be shipped down the Volga River as far as Astrakhan' and then by Reydtanker from Astrakhan' to Makhachkala.

approximately 600,000 tons of Tuymazy crude oil went from Astrakhan' to Makhachkala in 1950, and 800,000 tons went in 1951. 68/ These figures are believed to represent the maximum amount of Tuymazy crude oil that was transported between these two places.

E. Total Shipments.

For 1948 it is possible to make a fairly good estimate of the total shipment of petroleum on the Caspian Sea. These figures are shown in Table 5.*

It is possible to draw only general conclusions on the trends which are believed to have developed since 1948. In 1949 the first shipments of Tuymazy crude oil from Astrakhan' to Makhachkala were noted, and these have continued, representing an addition to the total shipments estimated in 1948. Shipments of crude oil from Baku, however, decreased somewhat in 1949, probably because of a temporary decrease of the production

* Table 5 follows on p. 22.

Table 5

Estimated Total Caspian Sea Shipments
of Petroleum
1948

Point of Origin	Destination (Thousand Metric Tons) Krasnovodsk	Makhachkala	Astrakhan'	Gur'yev	Totals by Point of Origin	Percent of Total
Baku	1,300	3,090	3,960	715	9,065	89.2
Krasnovodsk		315	485		800	7.9
Makhachkala			300		300	2.9
Totals by Destination	1,300	3,405	4,745	715	10,165	100.0

of crude oil during that year. There has also been an increasing surplus of crude oil at Krasnovodsk since 1948. This surplus has undoubtedly found its way into shipping lanes on the Caspian Sea. Total shipments, therefore, may be assumed to have increased between the years 1948 and 1953. It is believed that the pattern of shipping shown in Table 5 has remained about the same, with Baku maintaining its position as the predominant shipping point and with Krasnovodsk increasing in importance because of its growing surplus of crude oil. It is not possible to make a firm quantitative estimate of the increase in total shipments since 1948, but because of the increased shipments of crude oil and the planned shipments of 7.5 million tons of various types of petroleum by Reydtanker for 1953 69/ it is believed that the present volume of petroleum shipping is between 12 million and 12.5 million tons.

On the basis of a total one-voyage lift capacity of 280,000 tons (see Appendix A), an average navigation season of 280 days for each ship, and an average of 6 days for each round trip, it is estimated that the present maximum annual lifting capacity of the fleet is about 13.1 million tons. Thus the present estimated volume of shipping (12 million to 12.5 million tons) lies within the capacity of the facilities for transporting petroleum on the Caspian Sea.

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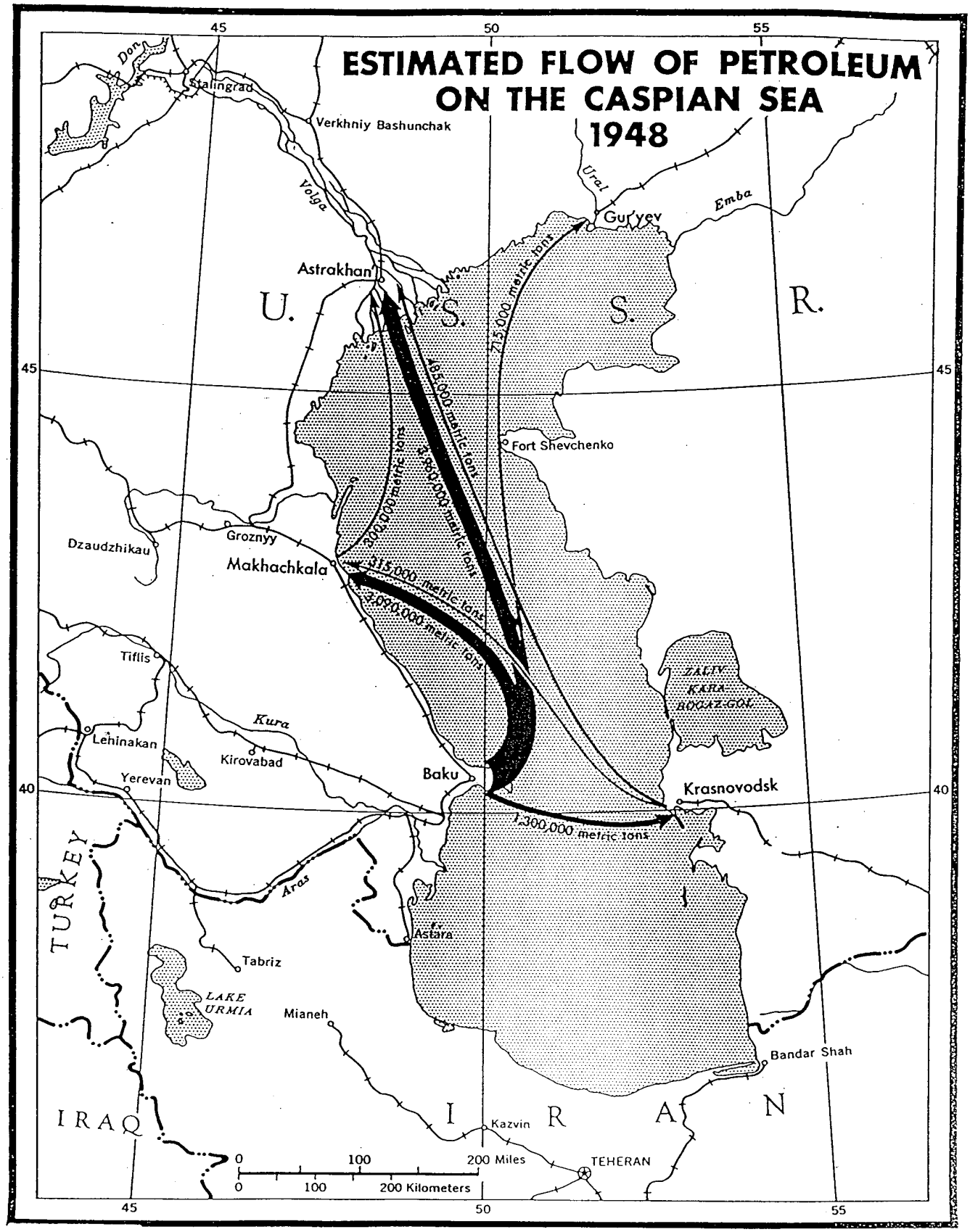
ESTIMATED FLOW OF PETROLEUM ON THE CASPIAN SEA 1948
45
50
55
40
Don
Stalingrad
Verkhniy Bashunchak
Volga
Ural
Emba
Guryev
Astrakhan
U. S. S. R.
215,000 metric tons
485,000 metric tons
2,980,000 metric tons
200,000 metric tons
Fort Shevchenko
Dzaudzhikau
Groznyy
Makhachkala
315,000 metric tons
2,090,000 metric tons
Tiflis
Kura
Lehinakan
Kirovabad
Yerevan
Baku
ZALIV KARA BOGAZ-GOL
Krasnovodsk
1,300,000 metric tons
TURKEY
Aras
Astara
Tabriz
LAKE URMIA
Mianeh
Bandar Shah
IRAQ
I R A N
Kazvin
TEHERAN
0 100 200 Miles
0 100 200 Kilometers

APPENDIX A

VESSELS IN OPERATION ON THE CASPIAN SEA 70/*

(Appendix A contains Tables 6 through 9.)

Table 6

Tankers in Operation on the Caspian Sea since 1 January 1950

Name of Vessel	Gross Tonnage	Estimated Carrying Capacity (Metric Tons)	Year Built	Year
Agamali Ogly	6,092	8,529	1930	1953
Aleksey Tolstoy	692	969	1942	1951
Alesha Dzhaparidze	2,306	3,228	1905	1952
Andrey Zhdanov	6,280	8,792	1934	1952
Artem	1,128	1,579	1898	1951
Aziya	1,323	1,852	1898	1952
Baskunchak	N.A.	2,100 a/*	N.A.	1950
Beriya	6,280	8,792	1935	1953
Budennyy	1,387	1,942	1897	1952
Buynak	499	699	1936	1952
Cheleken	N.A.	2,100 b/	N.A.	1953
Chimkent	1,000	1,400	N.A.	1953
El'brus	N.A.	1,500 a/	N.A.	1950
Galiley	1,581	2,213	N.A.	1953
General Aziaslanov	N.A.	9,500 a/	N.A.	1953
Gornyak	1,190	1,666	1897	1952
Gorokhovets	N.A.	2,100 b/	N.A.	1953
Iskra	1,050	1,470	1903	1951
Izmail	3,702	5,183	N.A.	1952
Kaganovich	6,280	8,792	1935	1952
Kalinin	1,500	2,100	N.A.	1953
Kapitan Plaushevskiy	715	1,001	1942	1952
Kirov	1,758	2,461	1902	1951
Komintern	6,092	8,529	1932	1953
Komsomol	1,520	2,128	1903	1952
Krasnovodsk	573	802	1893	1950
Kreml'	801	1,121	1898	1952
Krest'yanin	4,404	6,166	1909	1953

* Footnotes for Table 6 follow on p. 28.

Table 6

Tankers in Operation on the Caspian Sea since 1 January 1950
(Continued)

Name of Vessel	Gross Tonnage	Estimated Carrying Capacity (Metric Tons)	Year Built	Year
Lafarg	1,244	1,742	1897	1952
Lenin	6,092	8,529	1928	1953
Marat	1,050	1,470	1897	1953
Marti	1,110	1,554	1897	1950
Metallist	N.A.	2,400 b/	N.A.	1951
Molodaya Gvardiya	N.A.	1,652 a/	N.A.	1951
Molotov	6,280	8,792	1934	1952
Nakhichevan'	1,256	1,758	1888	1953
Nargin	670	938	1938	1953
Na Vukhte	1,308	1,831	1886	1953
Profintern	6,092	8,529	1928	1953
Rabochiy	4,099	5,739	1910	1953
Roza Lyuksemberg	730	1,022	1897	1952
Samarkand	1,234	1,728	1897	1950
Sovet	1,128	1,579	1894	1952
Sovetskaya Gruziya	1,545	2,163	1894	1952
Sovetskaya Ukraina	1,055	1,477	1897	1952
Soyuz Vodnikov	1,666	2,332	1898	1950
Stalin	6,280	8,792	1934	1953
Starosta Kalinin	1,726	2,416	1890	1952
Sverdlov	1,116	1,562	1897	1950
Syr-Dar'ya	750	1,050	1921	1953
Tsyurupa	6,092	8,529	1930	1953
Udarnik	1,581	2,213	1911	1951
Ukhta	1,145	1,603	1953	1953
Ukolovo	N.A.	5,000 a/	N.A.	1950
Valeriy Chkalov	5,600	7,840	N.A.	1951
VKP/B	6,092	8,529	1932	1952
Voenmor	1,307	1,830	1899	1951

Table 6

Tankers in Operation on the Caspian Sea since 1 January 1950
(Continued)

Name of Vessel	Gross Tonnage	Estimated Carrying Capacity (Metric Tons)	Year Built	Year
Volga	4,690	6,566	1912	1953
Volodarskiy	1,271	1,779	1903	1951
Yupiter	1,629	2,281	1897	1953
Zaysan	N.A.	2,100 a/	N.A.	1950
Zarya	1,300	1,820	1903	1951
30 Let VLKSM	N.A.	2,100 b/	N.A.	1950
Total		219,659		

a. Only the reported carrying capacity was available.
b. Carrying capacity arbitrarily assigned on the bases that the Cheleken, the Gorokhovets, the Metallist, and the 30 Let VLKSM are believed to be small tankers and that 2,100 tons is a reasonable capacity for a small tanker.

Table 7

Tankers in Operation on the Caspian Sea
before 1 January 1950

Name of Vessel	Gross Tonnage	Estimated Carrying Capacity (Metric Tons)	Year Built	Year
Bibi Eybat	N.A.	2,100 a/	N.A.	1949
Blyumberg	1,488	2,083	1895	1949
Edisson	1,472	2,060	1898	1949
Fedya Gubanov	1,675	2,345	1902	1948
Fridrikh Engels	N..	2,100 a/	NA	1947
Katayama	1,166	1,632	1894	1948
Klara Tsetkin	1,343	1,880	NA	1948
Kulibekov	1,754	2,456	1932	1948
Leytenant Shmidt	1,397	1,956	1903	1948
Lozovskiy	1,655	2,317	1898	1948
Lunacharskiy	1,305	1,827	1901	1948
Murav'ev	931	1,303	1881	1948
Sergey Chvanov	1,989	2,785	1909	1948
Sokrat	852	1,193	1882	1949
Sovetskaya Armeniya	1,319	1,847	1897	1948
03 Internatsional	3,833	5,366	1908	1947
26 Pamyat	1,143	1,600	1902	1948
Total		36,850		

a. Carrying capacity arbitrarily assigned on the bases that the Bibi Eybat and the Fridrikh Engels are probably small tankers and that 2,100 tons is a reasonable capacity for a small tanker.

Table 8

Large Barges Operation on the Caspian Sea since 1 January 1950

Name	Estimated Carrying Capacity (Metric Tons)	
Buguruslan	4,208	1951
Ishimbay (Self-Propelled)	4,000	1951
Kiliya (Self-Propelled)	3,998	1950
Malgobek	4,360	1951
Ren	3,822	1952
Tyulegen	4,700	1951
Total	25,088	

Table 9

Estimated Total Carrying Capacity of Vessels Observed in Operation on the Caspian Sea

		Metric Tons
Tankers	since 1 January 1950	219,659
Tankers	before 1 January 1950	36,850
Large Barges	since 1 January 1950	25,088
Total		281,597

APPENDIX B

CASPIAN SEA SHIPMENTS OF FINISHED PETROLEUM PRODUCTS FROM BAKU TO ASTRAKHAN', KRASNOVODSK, AND MAKHACHKALA

(Appendix B contains Tables 10 through 16.)

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Table 11

Caspian Sea Shipments
of Finished Petroleum Products
from Baku to Astrakhan' 72/
January-April 1949

Metric Tons

Product	Jan a/	Feb b/	Mar c/	Apr
Aviation Gasoline, Type B-74				8,716
Motor Gasoline				25,497
Ligroin			8,812	26,305
Tractor Kerosene			18,497	168,556
Lamp Kerosene				9,247
Summer Grade Diesel Fuel			9,356	51,910
Avtol, Type 10				14,274 d/
Avtol, Type 18				30,024
Motor Fuel			18,405	9,424
Bunker Fuel				9,445
Machine Oil				7,201
Spindle Oil				6,670
Motor Oil				1,718
Summer Grade Axle Oil				9,757
99 (Possibly Green Oil)				956
Total			55,070	379,700

d. Including 2,831 tons of avtol of unspecified grade.

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Table 13

Caspian Sea Shipments
of Finished Petroleum Products
from Baku to Makhachkala 74/
January-April 1949

Metric Tons

Product	Jan	Feb	Mar	Apr	Jan a/
Aviation Gasoline, Type B-74		8,839			8,000
Ligroin	8,707			17,689	25,000 b/
Tractor Kerosene		68,578	64,801	27,776	80,000 c/
Lamp Kerosene				9,263	
Special Kerosene		7,028	14,892	9,222	9,000 d/
Summer Grade Diesel Fuel		5,401	3,169	4,973	8,000
Winter Grade Diesel Fuel					7,000
Avtol, Type 10			1,422		8,500
Avtol, Type 18			6,831	10,158	11,000
Solar Oil		1,200		2,886	2,800
Motor Fuel		8,994	9,209	9,263	9,000
Machine Oil		2,171	3,063	1,413	
Spindle Oil				1,539	800
Summer Grade Axle Oil	1,300	9,202	9,201		9,000 d/
Winter Grade Axle Oil	1,800				
Unidentified					4,900
Total	11,807	111,413	112,588	94,182	183,000

a. Monthly plan figures.
b. Believed to be ligroin.

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Table 15

Caspian Sea Shipments
of Refined Petroleum Products
from Baku to Krasnovodsk 76/
January-April 1949

Metric Tons

Product	Jan	Feb	Mar	Apr
Aviation Gasoline, Type B-70		3,612		494
Aviation Gasoline, Type B-78 or B-95/130		3,834		3,864
Ligroin		426		
Tractor Kerosene	5,069	16,400	10,358	24,367
Lamp Kerosene			2,413	4,354
Special Kerosene				1,950
Diesel Fuel			1,213	
Summer Grade Diesel Fuel		8,898	14,268	13,245
Avtol, Type 10		1,131	1,119	2,949
Avtol, Type 18		4,430	5,243	6,136
Solar Oil		1,200	2,301	3,057
Motor Fuel		2,306	10,619	10,674
Bunker Fuel		10,128		
Machine Oil				2,793
Spindle Oil		1,092		
Motor Oil			547	
Summer Grade Axle Oil	8,807			1,151
Winter Grade Axle Oil	1,116			
Transformer Oil			423	
53 (Possibly Cylinder Oil)				816
Aviation Oil			400	
Total	14,992	53,457	48,904	75,850

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Planned Caspian Sea Shipments
of Finished Petroleum Products
from Baku to Krasnovodsk 77/
1948

Metric Tons

Product	Mar	May	Jun	Aug	Oct	Dec a/*
Aviation Gasoline, Type B-70		4,000	2,500 b/	4,000	4,500 b/	9,000
Aviation Gasoline, Type B-78	500	2,000		3,000	5,000 b/	5,000
Ligroin	24,500		4,000	14,000	6,500	2,000
Tractor Kerosene	69,000	8,500	8,000	5,000		22,000
Tractor Kerosene, Export Grade	500					
Lamp Kerosene	5,300	2,000		2,500	11,000	8,000
Lamp Kerosene, Export Grade		500	500	500 c/		
Diesel Fuel	22,000	26,000	20,000	5,000	18,000 d/	21,000
Avtol, Type 10	3,300	6,200	5,200	5,000	4,200	5,500
Avtol, Type 18	13,000	8,100	10,000	9,000	2,700	3,800
Nigrol	2,400	1,200	4,000	1,000	1,700	
Solar Oil	2,800	2,500		3,400	1,200 c/	
Motor Fuel		17,500		14,000	12,500	16,000
Bunker Fuel				12,000		10,000
Machine Oil	2,000	1,100	1,600	2,500	4,000	2,000
Spindle Oil	1,100	1,000			1,800	1,000
Motor Oil	900	800	1,100	800		1,000
Winter Grade Axle Oil				2,000		3,000
Summer Grade Axle Oil	4,000	5,500	1,500	3,000	2,000 b/	4,500
Transformer Oil		800		800	800	800
Bright Stock	800		800			
Diesel Lubricating Oil		1,000		1,000		
Cylinder Oil		800	800	800		1,600
Product 17 e/	1,000					
Product 31 e/	1,100					
Unknown e/		500			1,800	8,000
Computed Total	154,200	90,000	60,000	89,300	77,700	124,200
Given Total f/	154,200	106,000	60,000	89,300	80,000 g/	140,000

* Footnotes for Table 16 follow on p. 39.

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Table 16

Planned Caspian Sea Shipments
of Finished Petroleum Products
from Baku to Krasnovodsk 77/
1948
(Continued)

b. Grade not positively identified.
c. Product not positively identified.
d. Quantity uncertain.
e. Unidentified finished petroleum product.

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APPENDIX C

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APPENDIX D

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APPENDIX

E