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ASSESSMENT OF LIKELY TRANSBOUNDARY ENVIRONMENTAL IMPACTS (EIA) OF THE DANUBE-BLACK SEA NAVIGATION ROUTE IN THE UKRAINIAN PART OF THE DANUBE DELTA

Annex to the EIA Report Produced as Part of the Detailed Design Documentation for the Full-Scale Development Phase of the Danube-Black Sea Navigation Route Project in the Ukrainian Part of the Danube Delta

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Summary Report

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1. INTRODUCTION

The Environmental Impact Assessment study for the Danube-Black Sea Navigation Route (NR) in the Ukrainian part of the Danube Delta represented a stepwise exercise where various specific steps were undertaken at various stages of the design development process (Table 1.1), and reports produced in the course of the EIA process were duly and properly taken through the state environmental review procedure.

Table 1.1. A Brief History of the EIA Process for the Danube-Black Sea Navigation Route

Design Stage		EIA Volume, Year of Development	Developer	Objective	State Environmental Review Conclusion , Year and Source
Feasibility Study		EIA as Part of the Feasibility Study for the Danube-Black Sea NR Project in the Ukrainian Part of the Danube Delta, 2001	Institute of Marine Biology of the NASU, Odessa Branch. Odessa.	Selection of NR option based on environmental criteria. Options considered: Bystre Branch option, Tsyganka Branch option, and Starostambulsky Branch option	EIA Report routed back for refinement/ completion with a covenant to consider alternative options for the route. 2001. Ukrainian Scientific Centre of Marine Ecology, Odessa
		EIA for the Danube-Black Sea Navigation Route Options (Sluiced Canal from the Solomoniv Branch to the Zhebriansky Bay and Bystre Branch), 2002	USRIEP, Kharkiv	Selection of NR option based on environmental criteria (the first and foremost focus was placed upon the assessment of impacts of each option on the Danube Biosphere Reserve). Options considered: the Solomoniv Branch – Zhebiryansky Bay and Bystre Branch.	Positive conclusion for the Bystre Branch Option, 2003. Kyiv National Shevchenko's University
Detailed Design	Phase 1	EIA as Part of the Detailed Design for the Danube-Black Sea NR Project in the Ukrainian Part of the Danube Delta (Phase 1), 2003	USRIEP, Kharkiv	Environmental Impact Assessment study for the selected option of the navigation route and Phase 1 design characteristics/	Positive conclusion in 2004 granted by the expert team from the Kharkiv National Karazin's University
	Full-Scale Development	EIA as Part of the Detailed Design for the Danube-Black Sea NR Project in the Ukrainian Part of the Danube Delta (Full-Scale Development), 2004	USRIEP, Kharkiv	Environmental Impact Assessment study for the full-scale project, where the impacts of the Phase 2 works were singled out	Positive conclusion granted in 2006 after the EIA Report refinement/finalization by the expert team from the Kharkiv National Karazin's University and the Ministry of Environmental Protection of Ukraine

It should be noted the Feasibility Study stage involved the comparative analysis of potential alternative options but this analysis was not included in the English translation of the EIA Report that formed part of the Detailed Design documentation package for the Danube-Black Sea Navigation Route Project in the Ukrainian part of the Danube Delta and, subsequently, was not submitted for review to the international community and Romania as an affected party. This is explained by the fact that the results of the EIA study completed for the Navigation Route Project showed no indication of any significant transboundary impacts that could arise as a result of the proposed activity.

The EIA materials produced as part of the Detailed Design documentation package for the Phase 1 and Full-Scale Project were reviewed by the Inquiry Commission established under the Espo Convention, and the Commission concluded that the development and operation of the navigation route as proposed would be likely to give rise to some significant transboundary impacts and the proposed project should be therefore subject to procedures defined in the Espoo Convention.

The EIA Report produced as part of the Detailed Design package for the full-scale project development phase and submitted to the Romanian party had incorporated only preliminary findings of the Inquiry Commission because that report was produced and issued before the publication of the Final Report by the Inquiry Commission.

All the foregoing and obligations assumed by Ukraine under the Espoo Convention have created the need for amending the EIA documentation in line with the provisions and requirements of the Espoo Convention that relate specifically to the assessment of potential transboundary impacts that may be associated with the selected and alternative options of the navigation route.

The present Summary Report comprises factual information and findings from previous EIA reports produced as part of the Navigation Route Project and considered in the transboundayr context herein, and also recent data and materials collected through additional surveys undertaken since 2005 in order to facilitate a deeper insight into the potential transboundary effects of the navigation route that have been recognized as likely significant by the Inquiry Commission.

2. RATIONALE FOR THE TRANSBOUNDARY EIA PROCESS

The rationale for the transboundary EIA process stems from the key principles of the Espoo Convention that have been formulated by us in a way that is directly and specifically applicable to an economic activity proposed to be undertaken in the Lower Danube Basin, as follows:

- An Environmental Impact Assessment (EIA) process for a proposed activity that is intended to be located in the Lower Danube Basin should address and consider the entire ecosystem of this Basin, including the Danube Delta.
- Any planned activity that is perceived or known to affect the aquatic environment and wetland ecosystems presented in the Lower Danube Basin should be considered in the context of and in line with the Espoo Convention.
- Starting from a very early stage of the design development, the Party of Origin has to notify any Affected Party of a proposed activity and invite the latter party to take part in the EIA process.
- The Party of Origin should provide the Affected Party involved in the EIA process with all required information about the proposed activity, including the environmental impact assessment documentation that should meet relevant requirements of the Espoo Convention.

In line with the requirements specified by the Espoo Convention with regard to the content of EIA documentation to be provided to the Affected Party, the present document includes the following information:

(a) A description of the proposed activity and its purpose;
(b) A description of reasonable alternatives (e.g. locational and technological) to the proposed activity, including the no-action alternative;
(c) A description of those environmental components that are likely to be significantly affected by the proposed activity and its alternatives;
(d) A description of the potential environmental impact of the proposed activity and its alternatives, and assessment of its significance;
(e) A description of mitigation measures designed to minimize adverse environmental impact;
(f) A description of predictive methods and underlying assumption employed, as well a relevant environmental data used;
(g) An identification of gaps in knowledge and uncertainties encountered in the preparation of required information;
(h) A brief outline of environmental monitoring and management programmes, and any plans for post-project analysis;
(i) A non-technical summary including a visual presentation as appropriate (maps, graphs etc.).

The present EIA report has been produced in line with the provisions of the following laws, regulations and international documents:

Laws of Ukraine:

- On the Environmental Protection (25.06. 1991 No. 1264);
- On the Ambient Air Protection (16.10.1992 No. 2707);
- On Land Protection (19.06.2003 No. 0962)
- On Nature Reserves and Protected Areas of Ukraine (16.06.1992 No. 2456);
- On Plant Life (09.04.1999 No. 0591);
- On Animal Life (03.03.1993 No. 3041, amended 13.12.2001 No. 2894);
- On the Environmental Review (09.02.1995 No. 0045);
- On Plant Protection (14.10.1998 No. 0180);

Codes of Ukraine:

- Economic Activity Code of Ukraine (16.01.2003 No. 436-IV);
- Land Code of Ukraine (25.10.2001 No. 2768-14);
- Water Code of Ukraine (06.06.1995 No. 213/95);
- Air Code of Ukraine (04.05.1993 No. 3167-12);
- Code of Ukraine on Mineral Resources (27.07.1994 No. 132/94);
- Forest Code of Ukraine (21.01.1994 No. 3852-12)

Relevant International Conventions and Agreements Ratified by Ukraine:

- Convention on the Conservation of European Wildlife and Natural Habitats (Bern, 19.09.1979);
- Convention on Biological Diversity (Rio de Janeiro, 05.06.1992);
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar, 02.02.1971);
- Cartagena Protocol on Biosafety to the Convention on Biological Diversity (Montreal, 29.01.2000)
- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus, 25.06.1998)
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 25.02.1991)
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds (The Hague, 16.06.1995)
- Convention on Cooperation for the Protection and Sustainable Use of the River Danube (The Danube River Protection Convention) (Sofia, 29.06.1994)
- European Landscape Convention (Florence, 20.10.2000)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 23.06.1979)
- Pan-European Biological and Landscape Diversity Strategy (Sofia, 25.10.1995)
- Declaration on Environment and Development (Rio de Janeiro, 14.06.1992)

Annex 1 presents an overview of compliance of the navigation route restoration project in the Ukrainian part of the Danube Delta to the provisions of relevant environmental conventions and agreements ratified by Ukraine. This overview demonstrates that the above-mentioned project does not contradict any of international environmental commitments assumed by Ukraine.

In line with the provisions of the Aarhus Convention on Access to Information, Public Participation in Decision-Makinf and Access to Justice in Environmental Matters, the Statements of Environmental Consequences were published through mass media at each stage of the design development process; full texts of the EIA Reports produced for both phases of the Danube-Black Sea Navigation Route Project (Phase 1 and Full-Scale Project) were made available in the Russian and English languages on the official website of the project sponsor (the Delta Pilot State Company).

The following four public hearing events have been organized and held at various stages of the Danube-Black Sea DNR Project:

- The Feasibility Study stage: in 2003, in Ismail;
- The Project Phase 1 design: on 03.03.2004 in Vilkove;
- The Full-Scale Project design: on 17.12.2004 in Ismail;
- The Full-Scale Project design: on 20.12.2006 in Ismail. The materials and records from this public hearing event were transferred to the Romanian party on 27.01.2007 (No.51/23-215).

The Internet Conference on the Danube-Black Sea Navigation Project and status of compliance with relevant international conventions was held by the Delta Pilot State Company as the Project Sponsor on 25 June 2007.

On 21-23 September, 2007, the Danube Media Forum 2007 was held by the Ukrainian party to discuss various issues associated with the restoration of navigation activities in the Ukrainian part of the Danube Delta and transboundary impacts that are likely to be associated with the construction and operation of the proposed Danube-Black Sea navigation route.

On 26 September, 2007, the Ukrainian party welcomed and received the Joint Danube Survey 2 organised under the auspices of the International Commission for the Protection of the Danube River (ICPDR). The survey team sampled three sites in the Ukrainian territory: in Reni, in Vilkove, and directly at the project site (Bystre Branch).

Starting from 2003, i.e. from a very early stage in the project development, the Ukrainian party has organized and conducted many consultative events in the form of roundtable meetings, workshops and conferences attended by the governmental representatives and experts, both bilateral (Ukraine/Romania) and international. These include, inter alia:

- The Roundtable Meeting held to enable the national experts and scientists to discuss various navigation route options (23 May 2003, Kyiv);
- The Roundtable Meeting for the Ukrainian experts and journalists (17 July 2003, Kyiv);
- The International Expert Workshop "The Restoration of Transit Navigation Activities in the Ukrainian part of the Danube Delta and the Functioning of the Biosphere Reserve: Review of International Experience" (16-20 October 2003, Odessa);
- The Work Meeting on the Progress in Implementing the 2004-2010 State Programme for Sustainable Development of the Ukrainian Part of the Danube Basin, where the Danube-Black Sea DNR Project was presented to the national scientists and mass media (21 November 2003, Odessa);
- The NGO Meeting for the representatives of regional non-governmental organizations and public movements, which culminated in the signing of the document addressed to the Ukrainian citizens, public organisations, President and Government of Ukraine and expressing broad public support to the Danube-Black Sea DNR Project (May 2004, Odessa);
- The Danube-Black Sea DNR Project Presentation to the diplomatic mission heads representing the UN Economic Commission for Europe, Germany, The Netherlands, Finland, Slovenia, Hungary, Croatia, Bulgaria, Romania, Moldova, USA, Portugal, Sweden, Lithuania, Poland, Czech Republic, Japan, Russia, Kazakhstan, Israel, etc. (10 September 2004, Vilkove, the Crimean Arrow Motor Ship);
- A series of missions to Ukraine undertaken under key international environmental conventions (UN Economic Commission for Europe, Ramsar Convention, Bern Convention, Aarhus Convention, International Commission for the Protection of the Danube River (06-08 October 2004, Vilkove);
- The International Scientific and Practical Workshop "The International Review of Monitoring Results Collected during the 1st Restoration Phase of the Danube-Black Sea Navigation Route Project, Taking into Account other Human Activities and their Impacts on the Natural Ecosystems of the Danube Delta" (27-28 April 2005, Odessa);
- The International Conference "The Status and Prospects for Socio-Economic Development of the Ukrainian Trans-Danube Region: Issues and Challenges" (28 October 2005, Odessa);
- The International Scientific and Practical Conference "The Danube Delta Conservation and Sustainable Development" (26 February - 1 March 2005, Odessa);
- A series of work meetings between the Plenipotentiaries representing Ukraine and Romania on transboundary water management issues (Tulcea, Baia Mare and Kyiv);

- Informal international consultations with the representatives of UNEP, UNESCO, European Commission, International Danube Basin Commission (IDBC), Secretariats of the Ramsar, Aarhus and Espoo Conventions, World Wildlife Fund, Centre of International Environmental Law, and the International Union for the Conservation of Nature, to discuss the implementation of the Danube-Black Sea Navigation Route Project in Ukraine (21 September 2004, Geneva);
- Five joint meetings of the Ad Hoc Ukrainian-Romanian Working Group to discuss issues associated with the navigation activities in the Chilia and Starostambulske Branches of the Danube, with the special focus on the environmental issues (the first meeting was held on 12.11.2004 in Tulcea, and the most recent meeting was convened on 25.10.2007 in Galati, Romania), and other meetings between the Ukrainian and Romanian parties;
- Consultation with the involvement of the Romanian party was held on the assessment of environmental impacts associated with the full-scale development of the Danube-Black Sea Navigation Route Project in the Ukrainian Part of the Danube Delta on 18 June 2007 in Vilkove;
- In cooperation with the Romanian party, additional joint consultation was held on 18 July, 2007 in Tulcea (Romania) in order to discuss the EIA findings for the Project "Danube-Black Sea Navigation Route in the Ukrainian Part of the Danube Delta. Full-Scale Development".

The EIA Consultant and Project Sponsor provided a very detailed response to the comments and remarks expressed by the Romanian scientists and community representatives (please see Annex 2). International consultations and meetings convened at various stages of the project lifecycle were used to provide forum for reviewing, among other matters, the information and data collected as part of the monitoring programme. The official resolutions adopted at these meetings do not mention any project-related violations and/or non-compliances with respect to both national and international environmental laws.

3. DESCRIPTION OF PROPOSED ACTIVITY, ITS PURPOSE AND ALTERNATIVE OPTIONS

The Danube River flows through the territories of Germany, Austria, Slovakia, Hungary, Croatia, Serbia, Bulgaria, Romania, Moldova and Ukraine, being a vital transport link between Eastern and Western Europe. Fifteen European countries have access to the Danube, and nearly all Central/Eastern European river ports are connected to the Atlantic Seas (including the Black Sea) via the existing network of canals (Danube – Main – Rhine – North Sea; Danube – Oder – Elba – Baltic Sea; and Danube – Black Sea). In addition, canal links connecting the Danube with the Adriatic and Aegean Seas are now at various stages of design and construction.

The EU countries have increasingly focused on the development of trade routes linking the European and Asian regions by establishing transport corridors running, inter alia, via the Black and Caspian Seas. The ultimate objective is to maximize the efficient use of water transport, which has been and remains the cheapest mode of freight transport.

In the 1800-1900s, Romania established and developed an extensive network of canals in order to attract more traffic through its territory, including:

- Sulina Canal – an engineered international shipping route where the width of navigable channel is 60 m, designed to handle naval and combined-type (fluvial/naval) traffic;
- Cernavoda - Constanta South Canal with two sluices and 80 m bottom width;
- Medgidia - Navodari Canal – artificial canal connecting the Novodari port with the Cernavoda-Constanta Canal near the Medgidia port;
- Saint George Mouth, which has been heavily modified through straightening (Table 3.1, Figure 3.1).

Table 3.1. Navigation Routes Located in Romania, Existing and Planned

Route	Operational Since	Length, km	Depth, m
1. Sulina Canal	1858	79.6	7.30
2. Cernavoda - Constanta Canal	1984	64.2	7.0
3. Medgidia - Navodari Canal	1988	26	7.0
4. Saint George Mouth	Construction is underway	104.6	2.5–8.0

By contrast, the only navigation route, remaining in operation in the Ukrainian part of the Danube Delta (Ochakiv Branch – Prirva Branch – canal link) to handle ships with the draught as small as up to 2.5 m, was finally lost by the end of the 20th century due to progressive silting and excessive maintenance dredging requirement.

On the verge of the third millennium, Romania finally obtained a monopoly on vessel traffic between the Danube and the Black Sea, whereas the Ukrainian ports (Reni, Ismail, Kilia, Vylkove and Ust-Dunaisk) virtually suspended all freight handling and ship construction/repair activities. As a result, the entire Pre-Danubian region has fallen into a deep socio-economic recession, meaning drastic cuts in jobs and funding allocations for social needs. This can be attributed to the fact that the Pre-Danubian economy heavily relies on the port service and shipping infrastructure, including ship construction and repair facilities. In this respect, the Danube waterway has been and still remains a vital source fuelling the development of regional economy evolving around fluvial and naval navigation, and associated services.

Figure 3.1. Existing Navigation Routes in the Danube Delta

Since the mid-1800s, the Chilia Arm of the Danube Delta, including the Starostambulske and Bystre mouths, have been used for navigation. This can be illustrated by the fact that the maritime ports of Ismail, Reni and Kilia, located along the Chilia Arm, were established 180, 160 and 120 years ago, respectively. Between 1950 to 1957, the proportion of ship traffic routed via the Bystre mouth was about 40% of traffic received by the Sulina Canal (Source: The 1950-1974 Danube Commission Reference Book). At that time, the Bystre Branch was used to operate the Reni-Ismail-Kilia-Vylkove-Odesa passenger line served by the Kyiv shuttle steamer. There was no specially engineered/constructed navigation channel in that period in the Bystre Branch, because the natural river channel, wide and almost straight, was able to offer sufficient depths for vessel draughts of 2.5 m and higher, while the depths in the sandbar section were adequate to handle draughts of up to 4.6 m. Since 1957, the Bystre mouth had been closed for commercial shipping, remaining open only to military ships.

Starting from the late 1800s, several attempts had been made to improve the northern arms of the Danube's Chilia Delta and make them suitable for navigation. For example, the sandbars in the Pivnichny, Potapiv, Ochakiv and Prirva mouths were cleared but failed to function properly due to intensive silting.

In 1957, a pilot navigable passageway was cleared in the Prirva mouth to provide access to the Ochakiv and Chilia Arms for the combined fluvial/naval ships with the 3.5–4.0 m draught. The Prirva route represented a very heavy and continuously growing burden in terms of maintenance dredging requirement, which was at 150–200 thousand m^3 of soil per year in the early years of operation and swelled 20-fold by mid-1980s, when dredging had to be carried out on a continuous basis.

In the 1970s, a temporary canal was constructed to provide a connection between the Ust-Dunaisk port and the Danube via the Prirva mouth, whose surface width was about 20 m at the 2.5–3.0 m depth. The intention was to close this technical canal after the commissioning of the lighter-ship base, but this did not happen and this connection canal, where a dredge was required to operate on a continuous basis to enable the movement of vessels with the draught of up to 2.5 m. The Ochakiv Arm itself represents a difficult option for navigation due to the presence of shallows where sufficient depths cannot be offered all year.

In 1994, the operation of the Prirva route was ceased to resume in 1998 for only 2 months within which the minimum depth in the sandbar section fell below 1.2 m.

All the foregoing facts emphasize that the Chilia Arm of the Danube has been traditionally used for navigation throughout the 20^{th} century, even despite the increasingly tough requirement for maintenance dredging – especially in the past few decades. In the light of the above, the abandonment of traditional navigation activity in the Chilia Arm of the Danube Delta would have a devastating impact on the regional economy and people's livelihoods. Clearly, this option cannot be considered as a 'zero' or baseline scenario (no restoration of shipping route in the Ukrainian part of the Danube Basin), because in reality it would represent a 'negative' scenario that negates a mere idea of sustainable development of the Pre-Danubian region on the basis of traditional livelihood pattern. With this in mind, the following definition for a baseline scenario would seem reasonable and appropriate: the re-opening of navigation route along the Ochakiv and Prirva arms in order to restore the previous navigation arrangement that was in place in the Pre-Danubian region to facilitate ship traffic between the Danube and Black Sea.

Since its independence in 1991, the restoration of its own navigation route on the Danube has been among the top geopolitical and economic priorities for Ukraine. The importance of this task can be illustrated by the fact that Ukraine would inevitably lose control over one of the branches of the

transport corridor unless it is able to provide a direct and reliable route linking the Danube and the Black Sea, Romania would thereby gain a complete monopoly on sea-going ship traffic in the region. This scenario is fraught with serious economic implications, not only for Ukraine but also for many European countries, especially those located in the Danube Basin.

In the context of strategic geopolitical setting of Ukraine in the Eurasian region, where the country stands at the crossroads of major trade routes, the Government has adopted the National Network of International Transport Corridors (ITC) Development Programme, where ITC-7 (Rhine-Main-Danube) is the priority corridor comprising the Ukrainian Maritime Danube ports of Ismail, Reni and Ust-Dunaisk. The fact that the Chilia Arm is a powerful water artery underpins and encourages the development of a Ukrainian navigation route associated with the above-mentioned international transport corridor and capable of providing sufficient navigable depths for sea-going vessels.

The international community is interested in promoting and enhancing the international transport network, and this interest is primarily steered by economic considerations emphasizing the need for the provision of shorter freight transport routes linking Europe, Middle East and North Africa. The development of the Ukrainian navigation route on the Danube would provide an alternative to the Danube waterways owned by Romania, the latter's monopoly would be thereby terminated and cost of vessel transit reduced.

Strategically, the development of Ukraine's own navigation route would mean a significant step forward in improving the country's independence and security in military, energy and economic terms. This would also bring obvious and serious improvements to the region's social climate through the creation of new jobs and enhancement of people's livelihoods.

The selection of the most appropriate option for the Danube-Black Sea Navigation Route involved the analysis of over 10 options examined/developed with a proper level of detail, sufficient for the feasibility study and/or project preparation stages. The examined alternatives comprised a broad range of navigation means that might be practicable and workable in the conditions of the Ukrainian part of the Danube Delta, and featured both routing via existing branches and construction of artificial navigation canals. The main common feature of all existing alternatives is that all of them comprise the following elements: a section of the Danube and its Chilia Arm between the ports of Reni and Kilia; and, fully or partially, the section lying between the ports of Kilia and Vylkove. Table 3.2 presents summary information on eight of 10 alternatives and their routings. A 'zero' (or baseline) scenario featuring the shipping activity status circa the end of the 20th century is defined as the Option 6 (the restoration of navigation through the Prirva Arm).

The analysis of the late-stage performance of the Prirva navigation route demonstrates that its restoration can only be considered as a temporary solution because the Ochakiv system of Danube Delta arms is on the verge of dying out and therefore poses a very sizeable and continuous dredging/dumping requirement. This can be illustrated by the fact that the attempt to restore this route by dredging over 4.0 million m^3 of soil, undertaken in 1997-1998, lasted only three months. It can be concluded that the 'zero' scenario involves a very high degree of uncertainty in many respects and therefore represents a serious risk in environmental and technical terms. The four most promising options are displayed in Figure 3.2, where the base map is the 1995 map published by the Danube Wetlands Nature Reserve Directorate. The area of the Danube Wetlands Nature Reserve, which formed the current core of the Danube Biosphere Reserve, is coloured in green, and the most valuable ecological sites are marked in red.

As can be seen from this Figure, while the Bystre Branch route runs across the core zone of the Danube Biosphere Reserve (DBR), it lies away from the most valuable ecological sites, while this is not the case for the majority of alternatives considered.

According to the current DBR Zoning Scheme approved by the Resolution of the Cabinet of Ministers of Ukraine of 22.10.2008, the 50 m wide riparian strip extending along the Bystre and Starostambulske Branches is classified as the zone of anthropogenically modified landscapes where the development and operation of navigation activity, including the implementation of all related maintenance measures, are fully eligible under the national environmental legislation. Moreover, the DBR area has been extended to include the upper section of the Sasyk Lake and part of Jantshei Estuary as a compensation offsetting this zoning arrangement (Figure 3.3).

The detailed comparative analysis of various navigation route options and their environmental impacts was undertaken as part of the Feasibility Study process, and the results of this analysis confirmed that ***the Bystre option would represent the 'least-impact' alternative with regard to the DBR.***

The Bystre Branch option appears to provide the most appropriate solution for ensuing the long-term and successful operation of the navigation route, considered to be attributed to the following natural factors that are inherent to the Bystre Branch – as opposed to other branches of the Chilia Delta:

- Retarded marine delta advancement in the area of the Bystre Branch mouth;
- Gradual increase in river flow received by the branch among other branches of the Chilia Delta;
- Major proportion of suspended solid flow transported beyond the estuarine area;
- Relatively steep increase in sea depths beyond the sandbar.

The detailed description of the comparative multi-criteria analysis of various navigation route options and their potential transboundary impacts is provided in Section 4. This analysis features the use of the Analytical Hierarchy Process (AHP), adjusted to meet the specific needs of the present study. The results of this analysis have also confirmed that the Bystre Branch represents the most preferable option.

Given that the EIA study undertaken for the proposed Navigation Route Project as part of the Detailed Design Stage of the project development [1] classified the potential transboundary impacts of the Project as insignificant, the Cabinet of Ministers of Ukraine had adopted the decision that the Project should be implemented.

Table 3.2. Comparison of Existing Alternatives Considered for the Development of the Danube-Black Sea Navigation Route in the Ukrainian Part of the Danube Delta

Alternative Option	Projected Vessel Draught, m	Initial Dredging Volume, million m^3	Maintenance Dredging Volume, million m^3/year	Artificial/ Constructed Canal Length, Land-based / Sea (km)	Advantages	Weaknesses
1. Bystre Branch	7.2	3.47**	0.5	–/3	Low-meandering river channel with sufficient natural depths. Low rate of delta development. Where the Bystre Branch splits from the Starostambulske Branch, the entry radius is 950 m. The Bystre Branch is now at its reactivation phase.	Over 5 km of its length, the navigation route runs across the protected territory of the DBR. Riverbanks need to be strengthened in 3 locations. There is a requirement for the retaining dam to be constructed along the seaward access channel
2. Starostambulske Branch	7.2	4.04	0.8*	–/3.2	Stable natural river channel with sufficient depths. Two-way navigation	Over 5 km of its length, the navigation route runs across the protected territory of the DBR , and for additional 4 km it lies along the boundary of the DBR. *The route crosses the UNESCO's strictly protected zones near the islands of Kubanu,Lebedynka, Rybachy and Kurylsky.* *There is a spit cutting off the Musura Bay that continues its northward advancement.* Close proximity to the Sulina Canal. Starostambulsky sandbar grows and moves towards the Sulina canal entry located within the Romanian territorial waters. There is a need to demolish a stone dam located in the proted area, and the demolishment would require the use of explosives

Alternative Option	Projected Vessel Draught, m	Initial Dredging Volume, million m^3	Maintenance Dredging Volume, million m^3/year	Artificial/ Constructed Canal Length, Land-based / Sea (km)	Advantages	Weaknesses
3. Sluiced canal Solomoniv Branch – Zhebriyansky Bay	7.2	31.8	0.3	10 / 5.8	Canal runs outside the boundaries of the DBR protected area and outside the Delta's active zone	High construction cost. Large volume of dredging/excavation – soil storage would represent an issue. Land acquisition requirement is 900 ha, and forest cover would need to be destroyed. This option involves the construction of motor bridges with spans adjusted to let naval ships through. The hydrological regime of the Zhebriyansky Bay is a highly uncertain issue, with some sources (e.g. specialised papers published by Yu.D. Shuisky) suggesting that the Bay grows progressively shallow. The route would run across the Zhebriyansky "crest" area that is home to rare species and communities
4. Sluiced canal Solomoniv Branch – Sasyk Lake – Zhebriyansky Bay	7.2	33.0	0.2	20 / 1.5	Canal runs outside the boundaries of the DBR protected area and outside the Delta's active zone	The same weaknesses as in the previous option, exacerbated by unpredictable adverse impacts on the ecological status of the Sasyk Lake and surrounding areas. Canal route runs across the Stentsivsky Wetland area that is part of the DBR.
5. Sluiced canal connecting the Ochakiv Branch and Ust-Dunaisk port	6.25	11.8	1.55	5.25 / 6.75	Canal runs outside the boundaries of the DBR protected area. This option involves a relatively insignificant volume of maintenance dredging	Canal joins the Ust-Dunaisk harbourage area where siltation rates are very high. The Ochakiv system is on the verge of dying off. The 7.2 ship draught cannot be achieved and maintained. Riverbanks would need to be strengthened.

Alternative Option	Projected Vessel Draught, m	Initial Dredging Volume, million m^3	Maintenance Dredging Volume, million m^3/year	Artificial/ Constructed Canal Length, Land-based / Sea (km)	Advantages	Weaknesses
6. Zero Scenario: Restoration of navigation route along the Prirva Branch	**4.5**	**1.3**	**3.24**	**8.8 / –**	**Canal runs outside the boundaries of the DBR protected area. The option anticipates the restoration of navigation on the basis of existing route**	**Initial and maintenance dredging requirements estimates are underrated, so do the cost estimates. This option would provide only a temporary solution since the Ochakiv system is progressively dying off. Where the Prirva arm joins the Ochakiv arm, the turning radius is 400 m instead of 800 m which is required as a minimum. The restoration was attempted in 1998, but the route was only operational for three months due to enormous dredging requirement (4.0 million m^3)**
7. Deepened navigation route along the Prirva Branch	6.3	23.8	3.856	8.8 / 0.7	Canal runs outside the boundaries of the DBR protected area. The option anticipates the restoration of navigation on the basis of existing route.	This option would provide only a temporary solution since the Ochakiv system is progressively dying off. Significant dredging requirement, both initial and maintenance. High construction cost. Riverbanks would need to be strengthened and jetties extended
8. Ust-Dunaisk Port – canal link –Prirva Branch	5.0	1.3	1.2	5.0 / 6.75	Canal runs outside the boundaries of the DBR protected area. The option anticipates the restoration of navigation on the basis of existing route.	This option would provide only a temporary solution since the Ochakiv system is progressively dying off. A towboat would be required for each passing ship. The turning area would need to be established where the canal link joins the Prirva Branch. Other engineered measures that would be required for this option include a floating gate, flow guide dam and riverbank strengthening. The Zhebriyansky Bay is prone to intensive siltation and grows progressively shallow

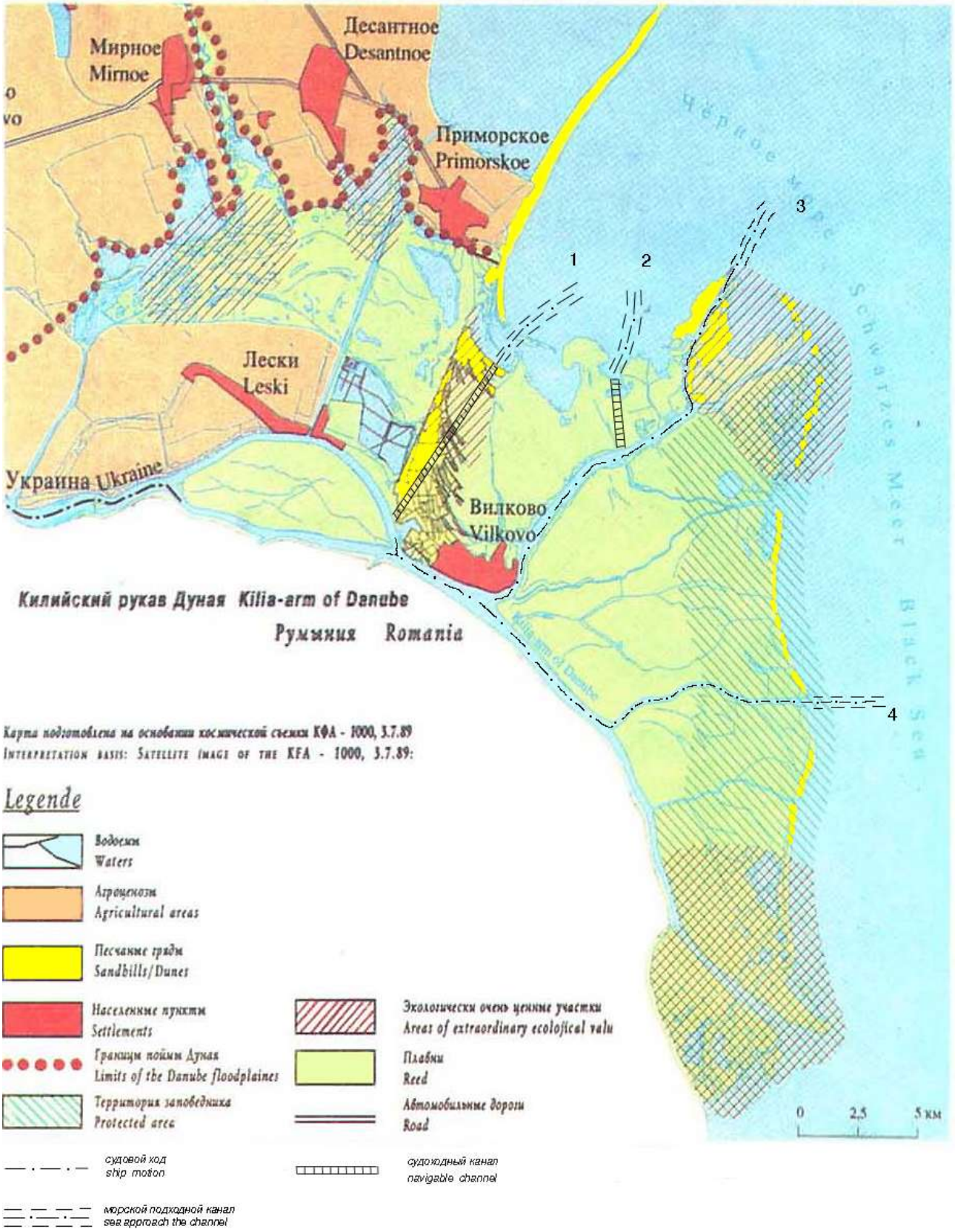

Figure 3.2. Various Options for the Danube-Black Sea Navigation Route, All Located within the Territory of the Danube Biosphere Reserve (DBR)

1 – the Solomoniv Branch – Zhebriyansky Bay sluiced canal
2 – the Ochakiv Branch – Ust-Dunaisk sluiced canal;
3 – the deepened navigation route along the Ochakiv Branch and Prirva Branch
4 – the Bystre Branch

Figure 3.3. Current Boundaries of the Danube Biosphere Reserve (Red Solid Line) and Its Strictly Protected Area (Dotted Line)

An extension made to the DBR area in line with the temporary zoning arrangement is marked by red line.

The project design as proposed featured a phased approach to the project implementation, where the Project Phase 1 only involved the dredging of the sandbar in the Bystre Branch in order to provide access to the sea in the form of the seaward access channel (SAC); construction of retaining dam to the north of the access channel (Figures 3.4 and 3.5); and deepening of shallows in the Chilia Branch between Ismail Chatal and Vylkove (Figure 3.6). The objective of the Project Phase 1 was to provide sufficient depths for ships with the 5.85 m draught.

The Project Phase 2 would involve the continuation of dredging and hydraulic engineering works in the sandbar section of the Bystre Branch and in the shallow sections of the Chilia and Starostambulske Branches in order to ensure compliance with the relevant international standards and provide sufficient depths for ships with the 7.2 m draught. Other provisions included in the Project Phase 2 design to ensure the stable operation of the navigation route relate to the completion of the retaining dam and construction of other technical structures that also form part of the project's environmental protection strategy (Table 3.3, Figure 3.7).

No dredging works were carried out in the channel of the Bystre Branch as part of the Project Phase 1. The full-scale development of the navigation route would involve an insignificant dredging requirement for the Bystre Branch channel, estimated at 76,000 m^3.

The detailed design for the full-scale phase of the Navigation Route Project promotes the 3.432 km seaward access channel (SAC) with 2,730 m retaining dam (1,040 m at the Phase 1). For the marine part of the navigation route, the estimated dredging volume would be 2,997,000 m^3 (of that, Phase 1 accounts for 1,774,000 m^3) during construction (this estimate does not apply to the extreme flooding events that occurred in 2005), and 250,000-1,200,000 m^3/year during operation, depending upon the intensity of flood flow.

Table 3.3. Protective Engineering Structures Included in the Navigation Route Design

Route Section / Structure	Length of Structure, m		Environmental Protection/Mitigation Function (Taking the Transboundary Aspects into Account)
	Phase 1	Full Scale	
Vylkove – Sea			
Flow guide dam	–	350	Limiting/diverting part of water/sediment flow received by the Bystre Branch, preventing/minimizing riverbank degradation and channel silting, minimizing the requirement for maintenance dredging. Offsetting the impact of the seaward access channel, causing a decrease in flow rates in the Starostambulske Branch downstream of the Bystre Branch outflow
Riverbank strengthening (Sections 1–4)	–	2107	Preventing riverbank erosion/scouring along the Starostambulske and Bystre Branchesminimins the potential for future redistribution of river flow between the downstream section of the Starostambuslke Branch and Bystre Branch in favour of the latter
Sandbar Section			
Retaining dam	1040	2730	Reducing/minimizing silting rates and maintenance dredging requirement for the seaward access channel, minimizing the effect of sea waves on the Ptashyna Spit, the likelihood of an adverse transboundary impact due to the transport of suspended solids towards Romania is thereby minimized.

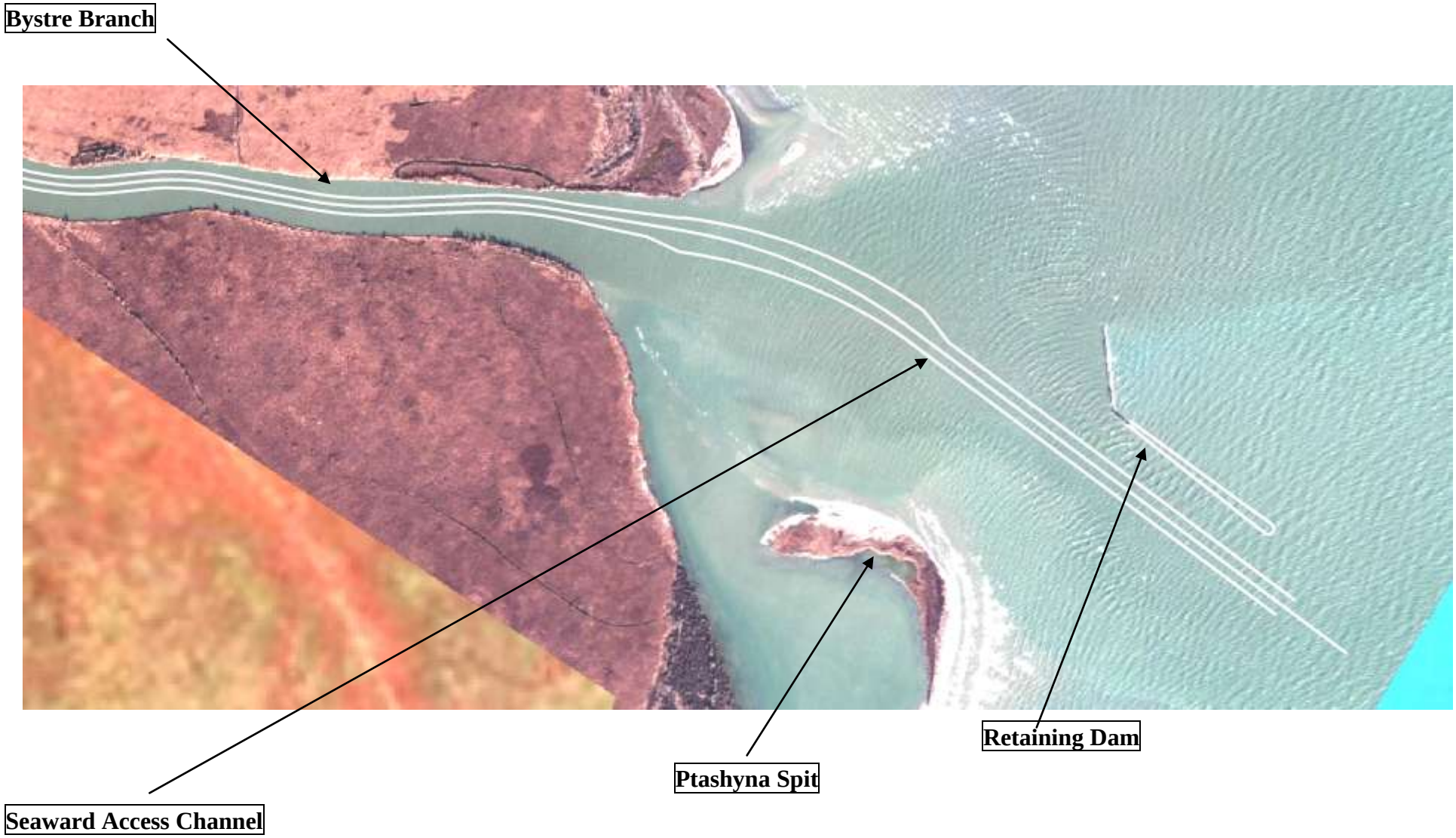

Figure 3.4. Current Status of the Bystre Branch Navigation Route

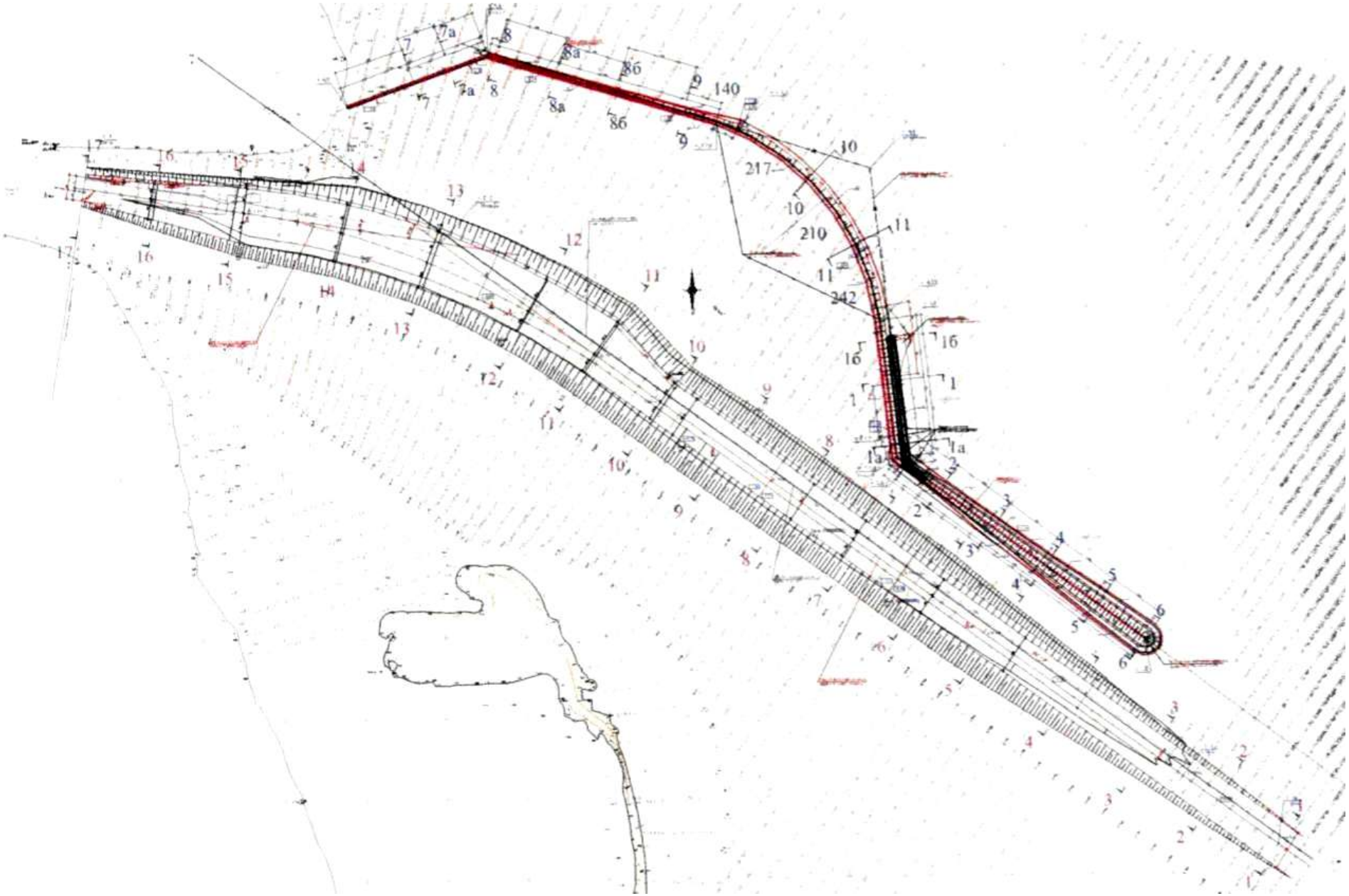

Figure 3.5. Seaward Access Channel and Retaining Dam (the completed section of the dam is black-coloured)

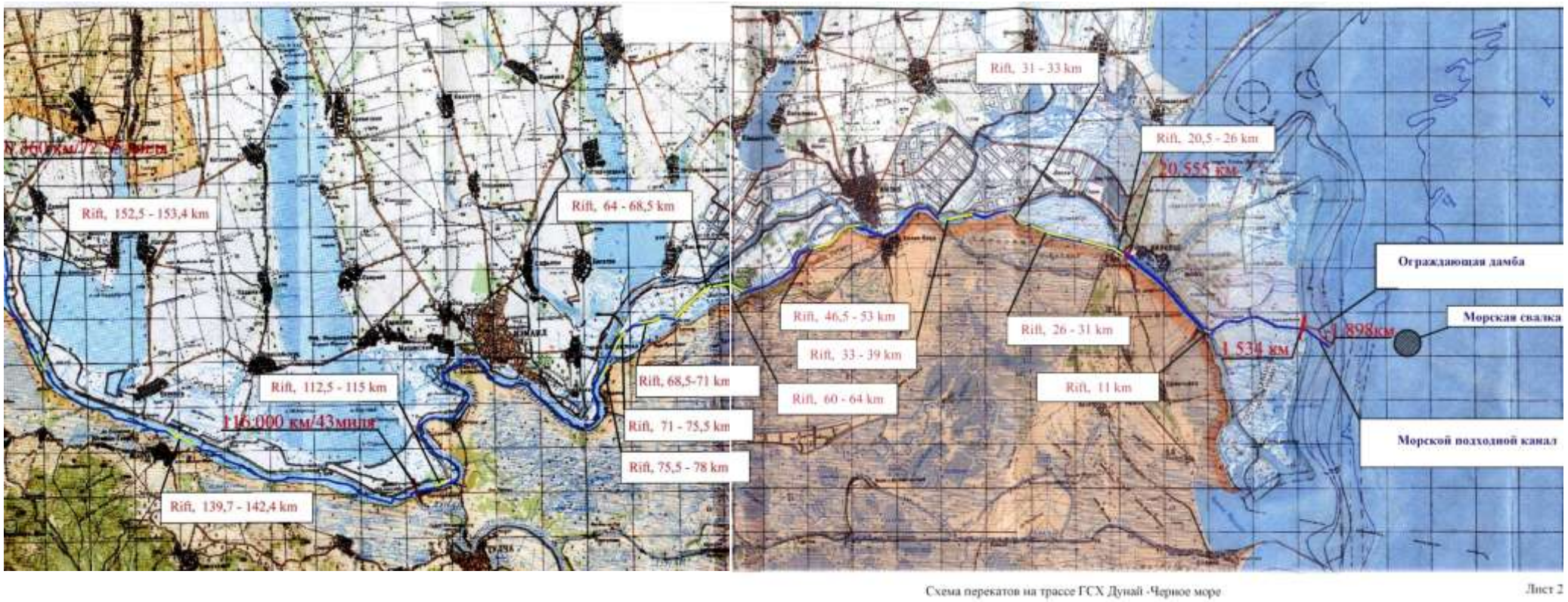

Figure 3.6. Layout of Navigation Route and Shallow Sections to Be Dredged (marked in yellow)

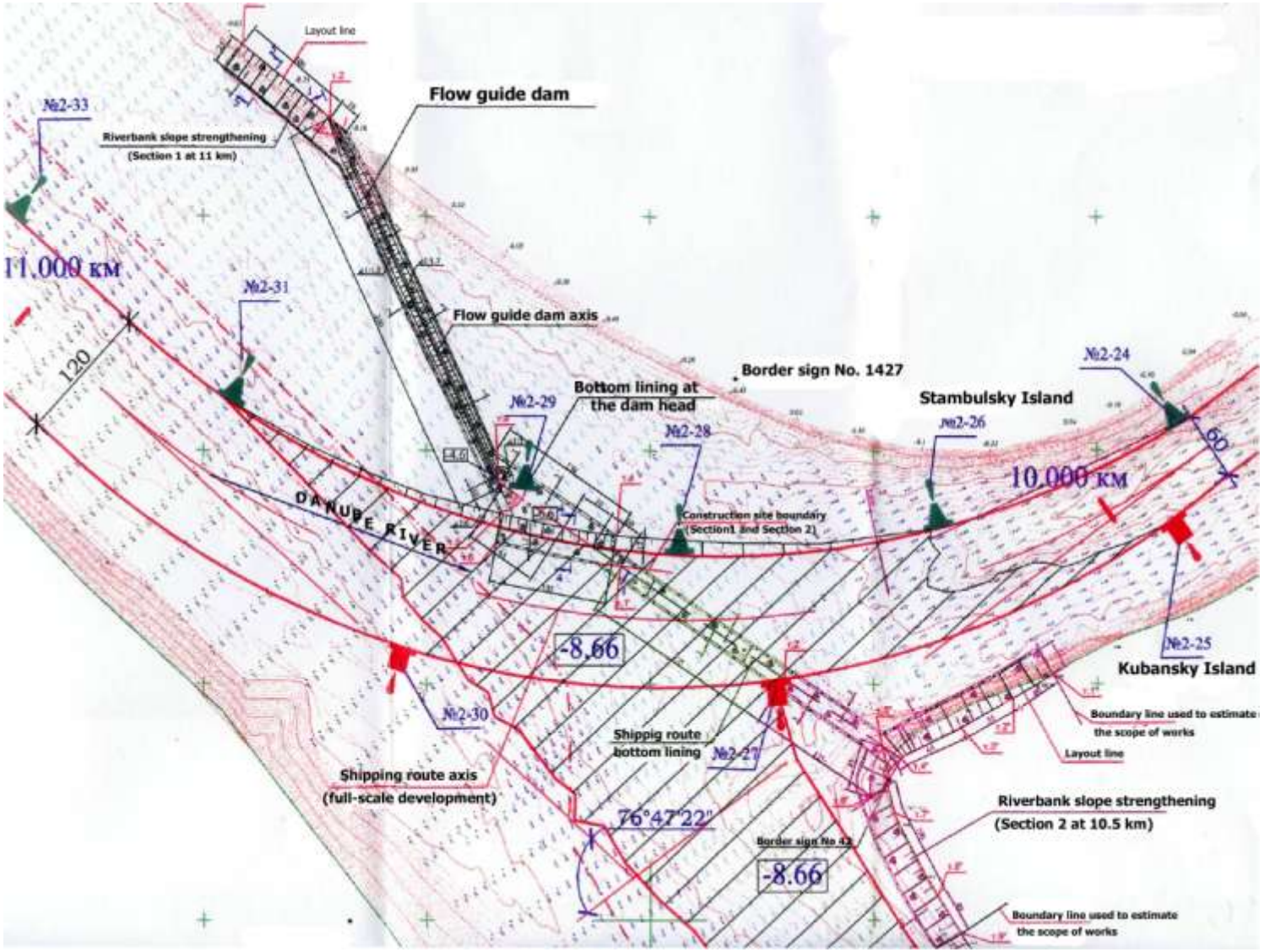

Figure 3.7. Flow Guide Dam and Strengthened Riverbank Sections at the Bifurcation of the Bystre and Starostambulske Branches

For over 90% of its length, the navigation route within the Ukrainian part of the Danube Delta runs along the Chilia Branch, where depths and widths are sufficient to meet the requirements set for an international waterway of the highest category. Dredging will be only required in the shallow sections (Figure 3.6). For the Reni-Vilkove section, the total volume of earth material anticipated to be dredged is 5,785,000 m^3 (1,727,000 m^3 for Phase 1) during construction, and 800,000 m^3/year on the average during operation. The estimated area of physical disturbance caused to the river bottom by dredging activities would be at 2,336,000 m^2 during construction and 1,020,000 m^2 during operation, i.e. 2.9% and 1.3% of the total area of river bottom, respectively, and would not cause any significant impact to bottom communities present in the Chilia Branch.

It should be emphasized that the Project Phase 1 is an interim stage in the project development cycle that aims to check and confirm the validity of proposed design solutions and technical parameters of protective structures planned to be constructed as part of the full-scale project development phase. The construction and commissioning of these planned protective structures are imperative to ensuring that environmental impacts of the navigation route are mitigated/minimized. With this in mind, further sections of the present document consider and describe potential environmental impacts of the navigation route in relation to the full-scale phase, which incorporates and builds on the parameters achieved at the first phase of the project.