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REGULATIONS ON MAINTENANCE AND REPAIR OF CPC PIPELINE SYSTEM UNDERWATER CROSSINGS

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CONTENTS

1. PURPOSE

1.1. The document establishes the procedure for condition monitoring, maintenance, repair and emergency response works arrangement and performance at CPC pipeline system underwater crossings (PSUC).

1.2. The regulation is the fundamental document for underwater crossings maintenance and repair planning and performance and for development of a documents package detailing particular provisions of the regulation.

2. SPHERE OF APPLICATION

The Regulation applies to underwater crossings established under the CPC oil-pipeline system construction plan and.

intended for use in production activities of the structural subdivisions of the CPC, as well as contractors, in planning and performing maintenance and repair works at underwater crossings.

3. TERMS AND DEFINITIONS

The terms and definitions presented in Appendix A are used in the Regulation.

4. ACCEPTED ABBREVIATIONS

The abbreviations presented in Appendix B are used in the Regulation.

5. REFERENCED CODES AND STANDARDS

1. SP 86.13330.2014 Main (Trunk) Pipelines.
2. SP 36.13330.2010. Main (Trunk) Pipelines.
3. RK PST 42-2015 Main oil pipelines. Operation.
4. RK ST 2081-2011 Crude oil pipelines. Operation Safety Requirements.
5. CPC VRD 09.09.2014 Guidelines on technical operations of CPC oil transportation system.
6. CPC VRD 26.01.2008 Regulation for organization and planning of maintenance and repair of the CPC pipeline system's linepipe equipment and facilities
7. CPC VRD 34.09.2014 Regulation on work to be performed in the pipeline safety zone.
8. CPC VRD 111.12.2012 Safety rules at production activity of oil pipeline system of CPC

6. COMPOSITION OF AN UNDERWATER CROSSING

6.1. Sections of the oil-pipeline passing below the level of the bottom of water barriers with a width of over 25 meters at low water are considered as underwater crossings.

6.2. The boundaries of the underwater crossing, determining its length, are:

- the shutoff valves set up on the shores;
- for crossings without shutoff valves – the high water level with a 10% exceedance probability.

6.3. The laying of the pipeline across a water barrier shall be performed:

- by the trench method, with bottom penetration;

- by the trenchless method (the method of horizontal directional drilling).

6.4. The underwater crossing includes the following structures and equipment (elements of the underwater crossing) as:

1) the section of the main oil pipeline within the boundaries of the underwater crossing, with protective and ballasting structures;

2) units of the shore valves;

3) bank stabilization and bottom stabilization structures, intended for preventing washout of the oil pipeline;

4) warning signs around the fenced-off area of the underwater crossing on navigable rivers;

5) indicating marks and leading beacons of the pipeline axis on the shore sections of the underwater crossing;

6) stationary markers for standard survey pegging (SSP);

7) cathodic protection stations (CPS) of the pipeline;

8) transformer substations and electricity transmission lines for supplying power to the electric drives of the shore valves, electrochemical protection means, line telemetry, lighting;

9) pressure tap units, separately located vents, observation shafts, pressure gage units, indicators of the passage of smart pigs.

6.5 The underwater crossing fenced-off area warning signs on navigable and floating rivers should be lit up at night during the navigation period.

6.6 The stationary leading beacons of the crossings must be set up along the axis of the pipeline, one beacon on each shore.

6.7 On each shore of the underwater crossing, at least two stationary geodetic beacons (bench marks) must be set up below the ground frost penetration level and installed according to the “Instructions for topographical survey on the scale of 1:5000, 1:2000, 1:1000, 1:500” GKINP-02-033-82.

7. TECHNICAL DOCUMENTATION

7.1. Organization and performance of maintenance and repair work shall be governed by:

- the design and working documentation for underwater crossings;
- legislative and normative documentation of the Russian Federation and the Republic of Kazakhstan, Company internal normative documents;
- operating documentation for operating the CPC pipeline system (including reports and certificates of examination of the state of the underwater crossings, plans for eliminating possible accidents at underwater crossings, repair work performance plans);
- these Regulations.

7.2. The CPC regional operations departments in charge of underwater crossings must possess the following documentation:

- design plans of the underwater crossings and in-line profiles of the pipeline;
- working documentation on quality control for commissioning of underwater crossing;
- plans for emergency response;
- technical passports of underwater crossings;
- reports and certificates of examination of the state of underwater crossings;
- work schedule for checking the state of and maintaining and repairing of underwater crossings;
- this Regulation.

7.3. Technical passport of an underwater crossing.

7.3.1. For every place where the pipeline system crosses a water barrier with a width of over 25 meters at low water, a technical passport must be prepared.

7.3.2. The technical passport shall include the sections presenting the following:

a) the structural specifics of the underwater crossing and the technical properties of its component parts;

b) information on the hydrological characteristics of the section of the water barrier and the climatic conditions in the region of the crossing;

c) information on the work carried out at the underwater crossing throughout the period of its operation;

d) basic information on emergency rescue operations at the underwater crossing.

7.3.3. Information on the work performed at the underwater crossing and the results are entered into the technical passport by the regional operations services within a period of not more than 10 days of the handing over of the working documentation.

7.3.4. The technical passports of underwater crossings shall be drawn up in documentary form and be kept by the regional operations service. In addition, to facilitate use of the informational materials, the passports of underwater crossings may also be prepared in an electronic form.

The form for the technical passport of CPC underwater crossing is presented in compulsory Appendix F.

8. CLASSIFICATION OF THE TECHNICAL CONDITION OF AN UNDERWATER CROSSING

8.1 The technical condition of underwater crossings is classified according to three categories:

1) in good working order, when all components of the underwater crossing comply with the requirements set by the rules, regulations, technical and design documentation;
2) serviceable with a limited life, when one or several of the components of the underwater crossing is damaged or close to breaking down;
3) unserviceable, if there is a discontinuity of pipeline sealing or the oil piping parameters have dropped below the level set in the standardized technical documentation.

8.2 In order to fulfill the tasks involved in maintenance and repair, the technical condition of serviceable underwater crossings is divided into three levels:

а) satisfactory conditions;

б) unsatisfactory condition;

в) pre-accident condition.

8.3 The parameters of the technical condition of the underwater crossing are:

- depth of the pipeline in the ground;
- state of the corrosion protective coating of the pipeline;
- the size of defects in the pipe metal and welds, and deformities of the pipes;
- state of the structures protecting against pipeline washout;
- state of the shore equipment of the underwater crossing at the shore sections.

8.4 Classification of underwater crossings according to their technical condition is given in Table 1.

Table 1

Technical condition	**Criteria of the technical condition**
Good working order	During the operating process, if there are changes in the river's shape, the depth of the pipeline corresponds to the set design rules. There are no discontinuities of the insulation or corrosion defects. There are no defects or only acceptable defects of the metal or welds and no deformities of the pipes. Structures protecting against pipeline washout correspond to the design requirements. No damage to the components of the underwater crossing (see item 6.4).
Serviceable, satisfactory	Minimum embedding depth of the pipeline from 1 to 0.5 meters; of the shore sections from 0.8 to 0.5 meters; washout of the pipeline possible within the next 3-5 years. There are discontinuities of the insulation of a pipeline provided with electrochemical protection. Corrosion defects and faults in the quality of the metal pipes and welds are within admissible limits. Damage to the structures protecting against pipeline washout and to the equipment of the shore sections of the underwater crossing can be eliminated during maintenance work.
Serviceable, unsatisfactory	Exposure of the pipeline in the bed or on the shore sections. There are discontinuities to the insulation of a pipeline, where minimum protection potential has not been maintained for a long time.

	The pipeline has non-hazardous corrosion defects, defects of the metal and welds, and deformities of the pipes. Structures protecting against pipeline washout are damaged to an extent requiring repair work.
Serviceable, pre-emergency	Exposure of the pipeline to over half its diameter in the bed part of a navigable river, irrespective of any sagging or the length of the washed-out section. Sagging of the pipeline over a length of more than 20 D_{nom} of the pipeline in the bed of a non-navigable river. Sagging of the pipeline in the shoreline and shore sections in an ice-drift or flood-water current zone. As per the results of diagnostics, there are hazardous corrosion defects, defects of welds and deformations of the pipes.
Non-serviceable	Damage of the walls of the pipe, requiring a lowering of the oil piping parameters. Damage of the pipe walls, with a consequent loss of sealing.

9. ORGANIZATION OF THE MAINTENANCE AND REPAIR OF UNDERWATER CROSSINGS

The basic principle for maintaining the design characteristics of an underwater crossing during its use consists in organizing a system of maintenance and repair (M&R) by monitoring its technical condition.

9.1. The M&R system for underwater crossings includes the following types of work, performed according to a set plan:

- monitoring of the technical condition of the underwater crossings;
- maintenance of the underwater crossings between overhauls ;
- scheduled repairs, which are subdivided into current repairs and major overhaul depending on the purpose, nature and volume of the work performed.

During use of the trunk oil pipeline, the need might arise for unplanned repairs (emergency-rescue operations) on underwater crossing sections.

9.2. Evaluation of the technical condition of a pipeline underwater crossing and decision-making on the need for repairs to a pipeline underwater crossing must be performed by the regional operations services on the basis of the following analysis:

1) the results of monitoring of the technical condition of the underwater crossing;

2) the results of examination of the corrosive state of the oil pipeline at the underwater crossing;

3) information on the defects, damage and accidents disclosed and eliminated previously;

4) forecasting of the technical condition and recommendations for further operation of the underwater crossing, received from specialized organizations;

5) technical data on the crossing and its compliance with the design characteristics;

6) actual and forecast indicators of pipeline loading.

9.3. The following shall be performed, according to the results of the analysis:

- clarification of the exact location and determination of whether the defective section can be repaired;
- planning of measures to prevent possible destruction of the pipeline;
- if necessary, additional flaw detection (external flaw detection);
- selection of the type and method of repair, determination of the volume of work and time schedule depending on the nature of the defect, whether the defective section can be repaired and the prospects for loading of the pipeline.

9.4. Repair work on CPC pipeline system underwater crossings includes:

- current repairs to the shore valves and structures;
- major overhaul (with replacement of the pipes and of the insulation coating, selective repair of the pipeline);
- emergency-recovery operations.

9.5. Repair work on the PSUC is performed in accordance with the approved plans and volumes of work, drawn up on the basis of conclusions regarding the technical condition of the facility.

9.6. During the calendar year, adjustment may be made of the work performance plans for current repair and major overhaul on agreement with the CPC Operations Department management . Grounds for adjustment shall consist of the results of investigations and checks carried out.

9.7. Repair work shall be performed by an organization holding the permitting documents as required by RF and RK legislation.

9.8 All repair work must be accompanied with documents in compliance with the requirements of the corresponding rules and regulations.

Repair work shall not be performed without a work performance plan and duly drawn up work orders, permissions and other necessary documents.

The person responsible for underwater crossings M&R is the regional Manager, Pipeline Operations and Maintenance. General supervision over all regional departments shall be performed by Manager, Pipeline Operations and Maintenance.

9.9. For the performance of maintenance, repairs and emergency response at PSUC maintenance contractor’s maintenance bases shall be used.

9.10. For the purpose of monitoring the quality of repair operations, observance of the technical operation mode and acceptance of work performed on order of the CPC, a responsible person must be appointed from among the engineering service personnel.

For these purposes, specialized organizations with corresponding experience, equipment, qualified personnel and the right (license) to perform the given type of activity may also be engaged.

Repair quality control must be confirmed by work documentation completed in the form of text, graphs and photographs.

Before repairs are initiated, partial or special examinations may be made in order to specify the decisions made during the planning stage.

9.11. During current repair and major overhaul, all the necessary maintenance operations shall also be performed.

9.12. Repair work on underwater crossings shall be performed in compliance with all the rules of labor protection and the rules in operation within the CPC.

10. MAINTENANCE OF UNDERWATER CROSSINGS

10.1. The measures for the scheduled maintenance of CPC pipeline system underwater crossings shall include:

a) monitoring of the technical condition of the underwater crossing and its components in order to determine whether they are still serviceable or not;

b) elimination of minor damages revealed during examination of the state of the underwater crossing;

c) scheduled maintenance of the shore valves;

d) performance of measures to prepare the underwater crossing for operation during the autumn-winter period and for the spring flooding.

10.2. All maintenance measures for the underwater crossing should, as a rule, be performed without interruption of pumping.

Individual maintenance procedures with respect to shore valves are performed during a period of planned interruption to oil transportation.

10.3. Repair work to underwater crossings should be performed by observing the rules of labor protection, environmental protection and fire safety, as well as the rules effective in the CPC.

11. MONITORING OF THE UNDERWATER CROSSINGS TECHNICAL CONDITION

11.1. Work to monitor the technical condition of underwater crossings is performed for the purpose of revealing factors that might constitute a threat to the safety and reliability of the operation of the pipeline system.

11.2. Work to monitor the technical condition of underwater crossings should be performed regularly, at the intervals stipulated by these regulations, by the efforts of the structural subdivisions of the CPC or specialized organizations holding the required permitting documents to engage in the given type of activity.

11.3. The need for unscheduled monitoring of an underwater crossing and the requirements concerning the type of monitoring are determined by the regional operations services of the CPC pipeline system or state supervisory bodies.

Unscheduled control should be performed in the following cases:

- if there are indications that the pipeline is in danger of breakdown;
- in the event of substantial changes in the loading mode or impacts compared with the design parameters;
- when planning major overhaul or reconstruction of the underwater crossing;
- in an emergency.

The volume of unscheduled control is determined in each individual case, taking into account the tasks to be solved, the availability of information on the current state of the facility and other factors.

11.4. For the purposes of monitoring the technical condition of an underwater crossing, the following must be performed:

a) technical inspection of the fenced-off area of the underwater crossing;

b) external examination of the underwater crossing;

c) technical diagnosis of the pipeline at the underwater crossing.

11.5. The purpose of the technical inspection of the underwater crossing is:

- to reveal oil-spills where they reach the ground or water surface;
- to discover and prevent work by other persons/organizations or the presence of machinery and structures belonging to such persons/organizations in the fenced-off area;
- to supervise correct performance of agreed-upon work in the vicinity of the pipeline and observance of safety measures;
- to disclose places where the protective ground layer has been washed out and where the pipeline is exposed on the shore sections of the underwater crossing;
- to determine the technical condition of structures and equipment on the shore sections of the underwater crossing;
- to disclose breakdowns in adjacent structures and facilities that constitute a real threat to the integrity of the pipeline.

11.6. Technical inspections of an underwater crossing are performed by ground (by vehicle or on foot) or air (by aircraft) patrols.

11.7. The results of the inspections must be recorded in the corresponding patrol (observation) register.

It is recommended that photographic evidence be taken for documentation of the results of the examination.

11.8. The main tasks of an external examination of the pipeline underwater crossing include:

- technical inspection of the underwater crossing;

- determination of the actual planned position of the pipeline with an error margin of not more than 0.5% of the scale of the geodetic survey;
- determination of the actual altitude of the ballasted pipeline;
- determination of the thickness of the protective earth layer from the top of the ballasted pipeline from the bottom of the water body, with an error margin of ≤0.1 m;
- determination of the existence of exposed (washed-out) and sagging sections of the pipeline;
- measurement of the height of the pipeline sag (elevation of the pipeline above the bottom) with an error margin of not more than 0.1 m and of the length of the sag with an error margin of not more than 0.5 m, in order to determine the scale of repair operations required to eliminate the sag;
- determination of places where the integrity of the pipeline's insulation coating is breached;
- discovery of changes in the bottom relief, location of banks and major accumulation forms in the riverbed compared with previous periods (design, construction, previous examinations of the crossing), establishment of a threat of washout of the pipeline as a result of changes in the riverbed formation;
- appraisal of the state of structures protecting the pipeline against washout;
- appraisal of the state of equipment on the shore sections of the underwater crossing;
- determination of the existence of foreign objects on the crossing site.

11.9. Depending on the volume of work and the tasks to be tackled, a distinction is drawn between full, partial and special external examination of the underwater crossing.

11.10. A full examination involves the work necessary for assessing all parameters of the technical states, as indicated in item 8.3.

The main requirements to machinery and equipment for external examination of underwater crossings, performed by the trench method, are set out in Appendix C.

11.11. Partial examination is performed to determine or specify the values of one or several parameters of the technical condition of the underwater crossing (soundings of the water depths, search for discontinuities in the insulation coating, and so on).

11.12. Special examination is performed to resolve some specific tasks, using special machinery and instruments.

The recommended types of special examination of underwater pipelines are:

- monitoring of the condition of the insulation coating and the corrosion state of the underwater pipeline, performed as part of a comprehensive examination of the corrosion protection of the pipeline;
- identification and external examination of anomalies discovered on the underwater pipeline according to diagnosis data;

- monitoring of ground water in the region of the crossing, by the method of horizontal directional drilling.

11.13. Performance of partial and special examinations is planned depending on the results of a set of operations to monitor the technical condition of underwater crossings.

11.14. The volume of work and the requirements to monitoring the condition of the underwater crossing must be set out in the work assignment for the examination, with which those actually responsible for performing the job should get acquainted.

11.15. The volume of work performed, the conditions and the results of a full, partial or special examination must be recorded in an original document – a certificate of examination of the underwater crossing, the content of which is entered into the passport of the underwater crossing.

The recommended form for this certificate is given in Appendix D.

11.16. According to the results of the full or special examination, a technical report shall be drawn up and submitted, at an agreed time, to the corresponding regional service.

11.17. The technical reports must include recommended measures to ensure accident-free operation of the underwater crossings.

Recommended measures can be of three types:

1) urgent measures, performed immediately or at the time indicated, essential for avoiding an emergency;

2) temporary measures, performed during a year, in order to stop the deterioration process in the technical condition of the underwater crossing;

3) measures that can be performed over a time period exceeding a year.

11.18. Working informational materials (descriptions, drawings, photos, video and so on) confirming the need for urgent measures should be handed over immediately by the person/organization performing the work to the regional operations services of the pipeline system.

11.19. Technical diagnosis of the pipeline at an underwater crossing is performed mainly with the help of smart pigs (SP) in which a variety of methods of non-destructive testing (in-pipe diagnostics) are used.

Diagnostic systems based on the acoustic emission (AE) method may be used.

11.20. The in-pipe diagnostics of a section of underwater crossing is performed, as a rule, as part of the diagnostics of the line portion of the pipeline.

In justifiable cases, stationary or temporary smart pig release or reception chambers can be installed at an underwater crossing to provide for its diagnostics.

11.21. Both mobile and stationary systems can be used for technical diagnosis of the pipeline and shore valves by the AE method.

11.22. The main types of maintenance of underwater crossings, including those performed by the horizontal directional drilling method, and the intervals between overhauls are presented in Table 1.

Table 1

Facility/type of job	Work schedule
Underwater crossing fenced-off area	
Air patrol during winter and summer high-water, during the period of ice-drift and flood-water	at least 1 every two weeks
Ground patrol, inspection of structures and equipment on the shore sections of the crossing	Once a month
Ground patrol, inspection of banks and sections above the water level of structures protecting against pipeline washout	Once a year at summer high-water Additionally – after anomalous flooding
Restoration and installation of overflow channels for heavy rain in order to prevent washout of the pipeline	Within a month of discovery
Checking of the illumination of markers at crossings across navigable rivers	Once a week during the navigation period
Correction of markers of the fenced-off area at crossings across navigable rivers	Once a year, during the spring or within a week of discovering damage
Painting of standard surveyor pegging markers, restoration of the channel	Twice a year in the spring and autumn
Elimination of damage to information signs, restoring inscriptions, painting	Twice a year in spring and autumn or within a week of discovering damage
Felling of trees above a height of 3 meters and restricting visibility of information signs and markers	Within a month of discovery
Repair, painting, checking of serviceability of equipment permanently located at the edge of an EOSL	Once a year after high water
Correction of the slopes of earth pits at the edges of the EOSL, clearing of weeds	When necessary
Underwater crossing	
Full examination of a crossing in good working order: For a navigable river For a non-navigable river	 Once every 3 years Once every 5 years
Full examination of a crossing in a satisfactory condition: For a navigable river	 Once every 2 years

For a non-navigable river	Once every 3 years
Full examination of a crossing in an unsatisfactory condition: For a navigable river For a non-navigable river	 Once a year Once every 2 years
Full examination of a crossing in a pre-emergency condition:	Before major overhaul
Pipeline within the boundaries of an underwater crossing	
Monitoring of the integrity of the pipeline's insulation on the shore sections of the underwater crossing by instruments	Once a year during the spring or autumn period
Periodical in-pipe diagnostics (provided dangerous defects are eliminated)	Once every 3 – 6 years
Soundings along the axis of the pipeline in order to establish any threat of washout as a result of deformations of the bed	Once a year, after high-water
Monitoring of lack of electrical contact between the pipeline and the protective shield	Once a year
Special examination of the oil pipeline	When necessary
Shore shutoff valves sites	
External examination of valves and fencing of the site	Once a month
Clearing of snow from the valves site	Once a week
Clearing of vegetation from the site	When necessary
Review and repair of valves, replacing the oil of the reduction gear, examination of the valves for complete opening and closing, painting (when necessary)	Twice a year, in the spring and autumn periods
Elimination of damage to the fencing around the valves site	Within a month of discovery
Restoration of hillside water-diversion ditches, clearing them of snow	Before the beginning of snow-melt
Line inspection wells	
Examination of the inspection well, appraisal of the state of the walls, cover, gland stoppers	Once a month
Installation of surveyor stakes and vents in case they may be covered with snow	In the autumn period
Clearing of the inspection wells, removal of snow from the cover in winter	When necessary
Banks	
Correction of slopes and strengthening of banks	Within a month of discovery

12. CURRENT REPAIRS AND MAJOR OVERHAUL OF UNDERWATER CROSSINGS

Current repairs are performed on underwater crossings in a satisfactory, serviceable condition.

12.1. Current repairs are characterized by small volumes of work and minor expenses for their performance.

12.2. Current repairs are performed by the maintenance contractor or specialized companies without interruption of pipeline operation.

12.3. Recommended methods of current repairs of underwater crossings are presented in Table 2.

Table 2

Type of damage	Current repair method
Washout and exposure of the pipeline in floodlands over short sections.	Protection by means of cementslabs, mats, covering the pipeline with earth
Destruction of the cover of the slope above the waterline, exposure of the pipeline on the slopes of the banks in the shoreline zone	Laying of mats, rock filling, pannier, covering with earth, paving, encasing in ferro-concrete slabs without underwater engineering operations (UEO)
Flooding of shore valves sites by surface and flood waters	Filling of diking areas with a crest level higher than the horizon with a 1% exceedance probability
Damage to signal markers of the fenced-off area	Repair of markers, including replacement of posts, signs, leading lights, storage batteries. Correction, replacement of defective posts, painting in the established colors
Damage of standing surveyor pegging (SSP) markers	Restoration of the number and position of SSP markers

12.5. The major overhaul of underwater crossings is performed based on the technical conditions and inspection findings.

12.6. The methods used in performing major overhaul to an underwater crossing are specified in the design developed by a specialized company.

13. EMERGENCY RESCUE OPERATIONS ON UNDERWATER CROSSINGS

13.1. This section considers emergency rescue operations for eliminating accidents in the channel section of an underwater crossing, caused by loss of structural integrity of a pipeline laid by the trench method, as a consequence of the appearance of blowholes, cracks or breaks in the pipe.

Emergencies not involving a loss of structural integrity, caused by an interruption to oil transportation, closure of the internal cross-section of the pipeline, as a result of valve faults, jamming of cleaning or smart pigs, oil congelation, or an interruption to transportation are not considered herein.

Emergencies at underwater crossings are established visually, from the appearance of oil on the surface of the water, and with the help of the SCADA system, according to the results of current pressure control, temperature, density and consumption data by means of dynamic modeling.

13.2. In order to speed up the discovery of oil spills at underwater crossings, special local systems may be installed.

Emergency rescue operations at underwater crossings are performed by emergency rescue teams the maintenance contractor, as well as by the efforts of local authorities.

13.3. Emergency rescue teams should consist of personnel trained to deal with emergencies at underwater crossings.

13.5. Emergency rescue teams should be equipped with equipment and materials for dealing with emergencies, as stipulated by the rules and regulations, as well as with any special equipment they might deem necessary for efficient response to the emergency and elimination of its consequences.

13.6. In order to maintain the necessary skills, members of the emergency rescue teams planned for work in emergency rescue operations should undergo training drills (TD) every year.

The TD programs should include practical training in separate emergency rescue operations for an underwater crossing:

- sealing the pipeline;
- application of corrosion-resistant insulation to the repaired section in a water environment;
- localization of an accidental oil spill on the water;
- cleaning the shoreline from oil spills;
- evacuation and disposal of oil-soaked ground and vegetation.

13.7. Engineering operations in the performance of emergency rescue operations should provide for:

- reliable restoration of the structural integrity of the pipeline operating under pressure;
- restoration of the designed strength level and carrying capacity of the pipeline under repair;
- minimum outage time for the pipeline to be under repairs;
- maintaining the design dimensions of the interior of the pipeline;
- minimum impact on the environment, adjacent utility lines and facilities.

13.8. The performance of emergency rescue operations depends on the nature and location of the emergency, the oil transportation mode in the pipeline and other factors.

The means for eliminating the emergency and the engineering repair operations must be selected depending on the type of emergency, the state of the pipeline and the operating conditions. Elimination of the emergency should be performed in accordance with the effective rules and regulations.

13.9. Repairs to the underwater crossing should be carried out in accordance with its design or as-built documentation of construction.

13.10. The study of the section where the emergency has occurred is carried out by means of diver examination and instrumental measurements for the purpose of determining the precise location and parameters of the defect and specifying the repair method.

13.11. Temporary sealing of the interior of the pipeline is carried out in order to reduce the oil spillage during preparations for repairs to the pipeline.

13.12. The main methods for restoring the structural integrity of the underwater section of the pipeline are presented in Table 3.

Table 3

Type of through defect	Repair method
Blowholes in the body of the pipe or weld	Temporary sealing using bandaging, stopper, screw plug, clamping device. Repair using a clamping sleeve.
Crack in a weld with a length of less than 0.5 outside diameter	Temporary sealing using a clamping device, emergency clamp. Repair using a sealing clamp. Repair using a welded sleeve, welded clamp.

13.13. The consequences of the emergency in the form of destruction of the landscape by equipment, pollution of the soil, vegetation and water bodies with oil, must be eliminated according to a time schedule agreed with the local authorities.

For the purpose of eliminating the consequences of the emergency (rehabilitation of the territory), the following measures are implemented:

- washing of the oil from the earth on the shore by means of water jets;
- gathering of the remains of the oil from the surface of the water using various types of sorption agents;
- removal of oil-soaked earth and vegetation.

14. ENVIRONMENTAL PROTECTION

14.1. Work on the maintenance and repair of underwater crossings of the CPC pipeline system is regulated by the state legal acts, rules and regulations in force in the sphere of environmental protection in the Russian Federation or the Republic of Kazakhstan (according to the location of the crossing).

14.2. Major overhaul to the underwater crossing must be performed provided a positive conclusion is obtained from the state environmental expert committee on the design documentation.

14.3. In the event of an emergency oil spill at an underwater crossing, the main regulating document of the CPC for measures concerning reclamation of land and cleaning bodies of water is the Plan for eliminating possible accidents at an underwater crossing of the oil pipeline system.

14.4. Contractors performing work at underwater crossings must have corresponding licenses for the work carried out and observe the requirements of environmental protection.

15. FIRE SAFETY MEASURES

15.1. Maintenance and repair work on underwater crossings of the CPC pipeline system shall be regulated by the state legal acts, rules and regulations pertaining to fire safety in the Russian Federation or the Republic of Kazakhstan (according to the location of the crossing).

15.2. Contractors performing work at underwater crossings should observe the set requirements for fire safety.

16. LABOR PROTECTION

16.1. Organization of labor protection during the maintenance and repair of underwater crossings of the CPC pipeline system shall comply with the demands of the legislation and state rules and regulations of the Russian Federation and the Republic of Kazakhstan, as well as Company documents on labor protection.

17. APPENDICES

Appendix A

Terms and definitions

Shore sections of an underwater crossing – sections delimited on the one side by the shoreline at the average high water level over many years, on the one hand, and by the boundaries of the crossing, on the other hand.

Embedding of an underwater pipeline – the thickness of the earth from the top of the weight ballast of a pipeline to the bottom surface of the water barrier.

Control of technical condition – testing that the values of equipment and structure parameters correspond to the requirements of the engineering documentation and determining on this basis one of the given types of technical condition at the given moment of time.

Critical length of a sagging section of an underwater pipeline – the maximum permissible length of a sagging section, at which resonance oscillations of the pipeline cannot yet occur or the effective stress does not yet exceed the design strength of the pipe material.

Low water level – the low stable water level in the river.

Examination of a crossing by instruments – technical control of the parameters or the condition of an underwater crossing using special measuring devices.

Full examination - examination during which the technical condition of all the component parts of the facility are tested.

Diving inspection – inspection of an underwater facility performed by divers.

Inspection of an underwater crossing – visual method for controlling the situation in the fenced-off area of the underwater crossing.

Fenced-off area of an underwater crossing – section of the territory along the pipeline route required to ensure the safe operation of the pipeline system, equal in length to the underwater crossing and in width limited by two parallel planes drawn at a distance of 100 meters to each side from the axes of the outside pipes of the pipeline and extending from the surface of the water to the bottom of the water body.

Flood period – relatively rapid and usually short-term rise in the water as a result of surface drain during intensive precipitation in the river basin.

Underwater crossing of a trunk pipeline – section of a pipeline laid along the bottom of a water barrier with a width of over 25 meters at low water.

Spring flood – period of a significant rise in the water level (high water) owing to an increase in the surface drain during mass snowmelt in the river basin, observed at one and the same time every year.

Sagging section of a pipeline – open (not embedded) section of the pipeline, with a gap between the bottom of the pipe and the bottom of the water body. The height of the sag is the maximum difference between the bottom surface of the water body and the lower generatrix of the pipe in the open section.

Riverbed – sunken part of a river valley along which the river actually flows.

Riverbed section of an underwater crossing – section delimited by the shorelines at the average low water level over a period of several years.

Average low water level over a period of several years – the arithmetic mean value of the low water level of the water barrier obtained by many years of observations.

Maintenance of an underwater crossing – complex of work to maintain the crossing in working order.

Technical operation of a pipeline system – use of the production complex of facilities, structures and equipment of the oil pipeline system for transporting oil from producer to consumer, including all the processes of the receipt, pumping and delivery of the oil, diagnostics, restoration of serviceability and reliability of the facilities of the pipeline system.

Technical condition – state of equipment and structures, described at a given moment in time, under specific environmental conditions and parameter values.

Waterline – edge of the water on the shore of the water body.

High water level (HWL) with an nth % exceedance probability – maximum water level in the crossing sector, with a probability of being exceeded n times in 100 years.

Appendix B

List of abbreviations used

ERS – emergency rescue station
SP – smart pig
IPD – in-pipe diagnostics
HDD – horizontal directional drilling
CPC – Caspian Pipeline Consortium
EOSL – emergency oil spill liquidation
SGM – sand/gravel mix
PSUC – pipeline system underwater crossing
MoS – Method of Statement
CPS – cathodic protection station
M&R – maintenance and repair
TD – training drill
ECP – electrochemical protection

Appendix C

Methodological instructions for full instrumental examination of underwater crossings performed by the trench method

1. Organizationally, full instrumental examination of an underwater crossing consists of preparatory, field and cameral stages.

2. At the preparatory stage, the following types of work are performed:

- gathering, studying and cameral processing of available engineering documentation on the underwater crossing;
- preliminary planning of the work, formation and preparation of field teams, training of personnel, knowledge checking;
- provision of complete sets of equipment and organization of regular servicing of special equipment and vehicles;
- drafting of the necessary documents for performing the work (engineering rules for the work, engineering tasks for the field work, enquiries and approvals).

Specific requirements on the job in hand (location, description of the facilities to be examined and scale of operations) are set out and supplied to the immediate operators in the form of engineering tasks for performing the work.

3. The main tasks of the field stage of the examination of an underwater crossing of a trunk pipeline include:

- determination of the actual planned position of the pipeline at the underwater crossing with an error margin of not more than 1 meter;
- determination of the actual elevation of the pipeline and thickness of the protective earth layer, with an error margin of not more than 0.1 meter;
- determination of the existence and length of exposed (washed out) sections of the pipeline, the elevation of the pipeline above the bottom (height of the sag) at washed out sections;
- determination of the location of discontinuities in the insulation coating of the pipeline;
- determination of the technical condition of the planned elevation survey markers, information signs, water level marking posts, valves sites, CPS, communication points and other elements of the underwater crossing equipment;
- appraisal of the state of structures for protecting the banks against washout;
- determination of the profile of the bottom of the water body;
- determination of the flow velocity fields;
- determination of the existence of foreign objects in the crossing zone.

4. Field works integrated into a unified engineering process include:

4.1 A preliminary survey of the underwater crossing within the boundaries of the shore valves site and the section adjacent to the crossing.

4.2 Instrumental examination of the pipeline in the riverbed and the shore sections of the underwater crossing.

4.3 Diving inspection of the underwater facilities at the crossing.

4.4 Observation of the dynamics of the water level during the period of sounding operations.

4.5 Soundings to assess riverbed deformations and to give a forecast of future changes.

4.6 Measurement of the water current speed in the crossing zone.

4.7 Preparation of current executive documentation, rapid cameral processing of field data, preparation of reports.

Preliminary survey of the underwater crossing

4.8 In the course of the preliminary survey of the underwater crossing, it is necessary to:

- make an inspection and assess the situation in the fenced-off area of the crossing;
- establish the location of the shore valves sites and the existence of other facilities in the engineering corridor of the crossing;
- establish the number, location and condition of standard surveyor pegs, information signs, marker points and so on, photograph the facilities on the shore sections of the crossing;

- inspect the above-water part of the bank stabilizing structures (if they exist) and assess their condition;
- inspect the banks of the river, determine the existence of washout zones on the basis of external features, landslides, rain rills, sinks and heaving of the earth;
- determine the location of all sounding zones and stabilize them with ranging rods;
- specify the methodology, order of priority and volume of the impending work;
- assess the visibility conditions between the standard surveyor pegs.

Instrumental inspection of the pipeline

4.9 Instrumental inspection of the pipeline is performed for the purpose of determining the current technical condition of the pipeline and includes the following types of work:

1) determination of the planned position and elevation of the pipeline;
2) measurement of the depth of the pipeline in the earth (thickness of the protective earth layer), revealing exposed sections of the pipeline;
3) search for discontinuities in the corrosion-resisting insulation of the pipeline.

4.10 Instrumental inspection is performed according to an approved methodology, using a set of special instruments in accordance with the instructions for their use.

4.11 During inspection of the pipeline in the riverbed section of the crossing, an underwater aerial system installed on the surface of the bed by a diver or from onboard a floating craft may be used.

4.12 The elevation of the pipeline and the riverbed line along the axis of the pipeline is determined relative to the stationary geodetic markers (benchmarks) included in the standard surveyor pegging of the underwater crossing.

4.13 Sites of damage to insulation in the form of discontinuities are determined according to the differences of the current leak potentials between the grounding points.

4.14 Measurement of the current leaks is performed in the same points which are used for measuring the planned elevation of the pipeline.

If sections are discovered with an insufficient embedding depth or insulation discontinuities, measurements must be taken at locations in-between.

4.15 The maximum permissible distance between points where the planned elevation of the pipeline is measured and the measurement of insulation integrity is indicated in the table below.

Width of water surface, m	Survey scale	Distance between measurement points, m
Up to 100	1:500	15 m
From 100 to 1000	1:1000	20 m
From 1000 to 2000	1:2000	40 m
Over 2000	1:5000	60 m

4.16. According to the results of the fieldwork, the operator draws up a report in the form presented in Appendix C.

Underwater engineering operations

4.17 Diving inspection includes the following types of work:

4.17.1 Inspection of the bottom of the water body in the crossing zone; during this inspection the diver should determine the nature of the bottom and earth profile and establish the existence of washed-out sections of the pipeline and foreign bodies.

4.17.2 Inspection of the state of washed-out (exposed) sections of the pipeline for the purpose of determining:

1) the length of the washed-out section;
2) the height of the sag from the bottom of the pipeline to the floor of the water body;
3) the technical condition of the pipeline's protective coating;
4) the existence and technical condition of the weight blocks.

Diving inspection of washed-out (exposed) sections of pipelines is performed after agreement with the operating organization.
4.17.3 Examination of the technical condition of the underwater part of the bank stabilization, during which the diver must establish the boundaries to its underwater part and the technical condition of the slope.
4.17.4 Specification of the situation on individual sections of the underwater pipeline with a thin protective earth layer (less than 0.2 m): the character of the protective layer of earth, the existence of pipe washout along the sides, and so on.
4.18 Diving examination of an underwater crossing is performed by means of diving inspection (with and without special equipment), tactile inspection (given poor underwater visibility), with the help of instruments to measure linear dimensions.
Given sufficient visibility in the water, it is recommended that photographs and videos be taken of the underwater facilities.
4.19 For orientation with respect to the pipeline runs, the diver should use an underwater line-seeker.

Sounding
4.20 Sounding includes:

- equipment of a temporary sounding post and its inclusion in the crossing's standard surveyor pegging.
- daily registering of the water level at the temporary sounding post, with a maximum error margin for water level readings of not more than 0.01 m;
- soundings of the depth by the point contact or continuous method in the fenced-off area of the crossing and in the section upstream from the crossing, over a distance at least equal to five times the width of the channel at low water.

4.21 Depth soundings should be performed along arbitrary lines crossing the water body, using an echo-sounding device, a manual sounding device, or marked cables.
4.22 The maximum distance between the sounding sites and between the places where the depth is measured at a sounding site when taking soundings in the fenced-off area of the crossing must not exceed the values given in the table below.

River width, m	Chart scale	Distance between sounding sites, m	Distance between sounding locations, m
up to100	1:500	10	5
from 100 to 1000	1:1000	20	10
from 1000 to 2000	1:2000	60	20
over 2000 Meters	1:5000	150	30

4.23 The maximum distance between the sounding sites when taking soundings outside the fenced-off area of the crossing must not exceed the width of the river.
4.24 Depth measurement readings must be performed with a discreteness of:

- 0.1 m for depths of up to 10 m;
- 0.2 m for depths from 10 to 20 m;
- 0.5 m for depths of over 20 m.

4.25 Soundings are taken by the point contact or continuous method from a floating craft or the surface of the ice.
4.26 When taking soundings by the point contact method from a floating craft, the craft is stabilized at the sounding location by an anchor or a marked cable.
4.27 The recommended report form for depth soundings is given in Appendix E.

Hydrometric work
4.28 The hydrometric work at the site of the underwater crossing is carried out in order to measure the speed of the current and the water flow rate at the working water level, measured at the temporary water sounding post.

4.29 At the crossing site, the direction and speed of the current are measured at gage points distributed at equal intervals across the site.

The speed of the current at the gage points is measured at no fewer than five points (close to the surface, at depths of 0.2, 0.6 and 0.8 meters and close to the bottom).

Where the water is shallow, the number of gage points may be reduced.

4.30 The number of speed gage points is dependent on the width of the river, according to the following table.

River width, m	from 25 to 50	from 50 to 100	from 100 to 300	from 300 to 600	over 600
Number of speed gage points	7	9	12	14	16

4.31 Work to examine underwater crossings must be performed by observing the rules of labor safety and the rules in force in the CPC.

Underwater engineering operations must be performed in observance of the requirements of GOST 12.3.012-77 “Underwater engineering operations. General safety rules” and “Unified rules for labor safety during underwater engineering operations”.

4.32 The work at the cameral stage includes:

- preparation of archive information materials for subsequent joint processing and comprehensive analysis;
- processing of the results of field measurements;
- analysis of the nature of river bed deformations taking into account previous examinations and forecasts of possible deformations in the future;
- disclosure of changes in the bottom profile, the location of shore banks and large accumulative forms in the river bed compared to previous periods (design, construction, previous examinations of the crossing);
- establishment of the threat of pipe washout as a result of shifting of river bed forms or wave erosion of the banks;
- elaboration of conclusions and proposals for further operation of the underwater crossing;
- drafting of technical reports and other documents on the work performed.

Appendix D
(recommended)

REPORT ON EXAMINATION OF UNDERWATER CROSSING
of the CPC oil-pipeline system
across the river _____

____ _____ 20…

This report is made in that, during the period from _____ to _____ 20….

_____
(name of organization performing the work)

an examination was performed of the CPC pipeline system underwater crossing
at the section from Stake_____ to Stake_____ by the method of

_____
(technical inspection, instrumental inspection)

Work performed

The examination of the underwater crossing included the following types of work:

- inspection of the shore sections;
- determination of the plan and elevation positions of the pipeline runs;
- determination of the thickness of the protective earth layer;
- determination of places where the insulation coating was damaged;
- examination of the underwater facilities;
- hydrological work;
- photographing of surface facilities.

Equipment used

The examination was performed using the following equipment:

1) _____
2) _____
4) _____
5) _____
6) _____
7) _____

Work environment

The examination was performed under the following conditions:

1. Water level from _____ meters to _____meters
2. Maximum current speed in the section under investigation from _____ m/s to _____ m/s
3. Maximum water depth in the processing zone _____ m.
4. Underwater visibility _____
5. Mud line_____ Foreign objects on the bottom _____
6. Air temperature_____, water temperature_____
7. Ice thickness _____
8. Shipping _____

Results of the examination

1. State of the geodetic support network: _____
   _____
   _____
2. State of the information and warning markers and others: _____
   _____
   _____
3. State of the valves site, inspection wells: _____
   _____
   _____
4. Type and state of bank stabilization: _____
   _____
5. Existence of bank erosion: _____

_____

_____

6. Width of water surface along pipeline axis: _____ m.
7. Maximum water depth along pipeline axis: _____ m.
8. Minimum pipeline embedding depth:
   on right bank flood bed _____ meters in the section
   _____
   on left bank flood bed _____ meters in the section
   _____
   in the river channel _____ meters in the section
   _____
9. Damage to the pipeline insulation:
   on right bank flood bed _____ meters in the section
   _____
   on left bank flood bed _____ meters in the section
   _____
   in the river channel _____ meters in the section
   _____

11. Existence of exposed and sagging sections, their location and length, height of the sag

_____

_____

Signatures

Appendix E
(recommended)

REGISTER

of river soundings at an underwater crossing of the CPC oil-pipeline system
across the river _____

Sounding date _____ 20___.
Water level _____ meters in relation to benchmark No._____
indicating _____ meters, located on the _____ bank.
Soundings performed by _____
(echo-sounding device, manual sounding device, marked cable)
Co-ordination of sounding sites in the plan was performed by _____
_____
angled intersections, tachymetry, GPS, distance meter, measuring line.
Fluctuations in the water level over the sounding period from _____ to _____

No. of sounding site	Distance between sounding points, m	Water depth, m	Comments

Indicate in Comments: shoreline;
beginning and end of exposed and sagging sectors;
places where diving inspection was performed

Appendix F
(compulsory)

Caspian Pipeline Consortium

TECHNICAL PASSPORT
of an underwater crossing of the CPC oil-pipeline system
across the river _____
(_____ Km – _____ Km)

CONTENTS

Page

INFORMATION ON THE PERSONS RESPONSIBLE FOR MAINTAINING AND CHECKING THE PASSPORT

Responsible for drawing up the passport

_____

Full name, position, signature

Responsible for maintaining the passport

_____

Full name, position, signature

Information on passport check by official

Full name	Position	Results of check	Signature, date

SECTION 1

TECHNICAL AND TECHNOLOGICAL CHARACTERISTICS OF THE UNDERWATER CROSSING

1.1. General information on the crossing

Pipeline section	
Operating organization	
Crossing construction type	
Underwater crossing design organization	
Construction organization	
Commissioning date	
Pipe external diameter, mm	
Pipe wall thickness, mm	
Pipeline steel type	
Crossing length (design), m	
24-hour duty guard at the crossing	

1.2. Description of the oil transported

Carrying capacity, m^3/per day	
Density, kg/m^3	
Dynamic viscosity, cSt	
Kinematic viscosity, cSt	
Congelation temperature,	
Flash point	
Self-ignition temperature	

1.3. Technical chart of the crossing

1.4. Design characteristics of the underwater crossing

Section category by SNiP 2.05.06-85	
Working pressure, kgf/cm^2	
Pipeline run length, m	
Pipe diameter, mm	
Pipe wall thickness, mm	
Pipe steel grade	
Test pressure, kgf/cm^2	
Pipe insulation type	
Pipe insulation protection	
Ballasting	
Minimum trench depth in river bed	
Minimum trench depth on right bank	
Minimum trench depth on left bank	

1.5. DESIGN PROFILE OF THE UNDERWATER CROSSING

1.6 Curved insertion pieces

No.	Purpose	Location	Characteristics	Comments
1	Curves in the horizontal plane			
2	Curves in the vertical plane			

Note. Valve tie-in point No._____ on the _____ bank is taken as the zero stake point.

1.7 Shore valves of the underwater crossing

Design number		
Kilometer along the line		
Location on crossing		
Stake number		
Location on crossing		
Elevation, m, Baltic System (BS)		
Valve type		
Nominal diameter (ND), mm		
Nominal pressure (NP), kgf/cm^2		
Housing		
Piston		
Seat		
Gate valve		
Manufacturer		
Control mode		
Electric drive		
Degree of electric drive protection		
Electric drive explosion protection		
Output shaft rotational speed		
Maximum torque moment		
Electric drive serial number		
Electric drive mass		
Reduction gear		
Reduction gear inventory number		

Note. Valve tie-in point No._____ on the _____ bank is taken as the zero stake point.

1.8 Test and measuring instruments

Description	
Brand, GOST	
Purpose	
Location (survey peg)	

1.9 Vents

Design No.		
Installation point		
Kilometer along the line		
Stake		

Elevation, m, Baltic System (BS)		
Quantity		
Nominal diameter (ND), mm		
Nominal pressure (NP), kgf/cm^2		
Location		

Note. Valve tie-in point No._____ on the _____ bank is taken as the zero stake point.

1.10 Packaged transformer substations

Location along the route, km		
Location at crossing		
Elevation, m, Baltic System (BS)		
Substation type		
Engineering specifications		
Upper voltage		
Lower voltage		
Mass		
Number		
Transformer		
Transformer type		
Input voltage (high)		
Output voltage (low)		
Oil mass		
Full mass		
Power transmission line type		
Power transmission line post material		

1.11 Cathodic protection station

Location on line	
Location of cathodic protection on crossing	
Cathodic protection station type	
Length of protected section, m	
Protection potential measure: at crossing beginning (_____ km) at crossing end (_____ km)	
Year commissioned	
Installation parameters	
Anode grounding line (AGL)	
AGL cable – type, length	
Anode grounding electrodes	
Spreading resistance, Ohms	
Assessment of condition	
Date of the last check of cathodic protection	

Addendum. CPS Location Chart

1.12 Communications points and cables

Unattended amplifier stations (UAS) are located in_____

Cable laid in _____ year.
Method by which cable laid in crossing river bed _____
Cable type _____
Number of lines _____
Location of cable line in flood zone _____
Location of cable line in river bed:

1. Main cable laid at a depth of _____ m over a distance of _____ m.
2. Spare cable laid at a depth of _____ m over a distance of _____ m.

1.13 Structures to protect the pipeline against washout

1.14 Equipment of the underwater crossing

Description	Right bank	Left bank
1. Information signs		
2. Tank for oil dumping from aerial crossing		
3. Fencing of valve units		
4. Banking of valve units		
5. Water-level measuring post		

1.15 Helicopter pads

Location	Elevation	Dimensions	Pad type	Comments

SECTION 2

HYDRO-MORPHOLOGICAL DESCRIPTION OF THE RIVER SECTION IN THE REGION OF THE UNDERWATER CROSSING

2.1 Meteorological conditions in the region of the crossing

2.2 Physical geography of the river in the region of the crossing

2.3 Hydrological information on the river section in the region of the crossing

2.4 Estimated levels of the river _____ in the region of the crossing

Level	Exceedance probability, %	Elevation of water, m
Maximum	1	
	2	
	5	
	10	
Minimum	50	
	75	
	95	

Note. Levels given according to the Baltic elevation system

2.5 Flow of the river _____ in the crossing zone

Description	Exceedance probability, %						
	1	2	5	10	50	75	95
Maximum, m^3/s							
Minimum, m^3/s							

2.6 Hydrometric measurements of the river in the crossing zone

Results of hydrometric work performed on the river _____

Sounding point	Date	Water level, m	Channel width, m	Maximum depth in zone, m	Maximum speed of surface current, m/s
Site No. _____					

2.7 River bed deformations

2.8 Benchmarks at the crossing and their elevations

Form, number, type of point	Description of point	Elevation, m, Baltic System (BS)	Installation date, executed by

SECTION 3

INFORMATION ON WORK PERFORMED AT THE UNDERWATER CROSSING

3.1 List of jobs performed at the underwater crossing

No.	Date	Type of work	Performed by	Comments

3.2 Results of previous instrumental examinations

Addenda: *arguments*
conclusion
recommendations
underwater crossing chart
pipeline lateral section

3.3 Results of in-pipe diagnostics

According to in-pipe diagnostics (IPD) of the pipeline, performed by the company _____ (final report - _____), on the _____ pipeline run within the boundaries of the underwater crossing (between shore valves No. _____ and No. _____), the following anomalies have been revealed.

Anomaly type	Distance to anomaly from valve No._____	Distance to anomaly from upper weld along oil flow	Distance to anomaly from lower weld along oil flow	Location of anomaly according to dial plate	Anomaly dimensions, length, mm width, mm depth %
1. Metal loss					
2. Possible lamination					
3. Faulty fusion of ring weld					
4. Faulty fusion of longitudinal weld					

Addendum. *Fragment of final IPD report*
Combined profile of_____ pipeline run according to the IPD data.

3.4 Short description of the design solutions for major overhaul of the pipeline

Addenda. *Reports on strength tests and integrity testing.*

SECTION 4

ELIMINATION OF POSSIBLE ACCIDENTAL OIL SPILLS AT THE UNDERWATER CROSSING

4.1 Equipment and materials of ERS _____ for localization and collection of accidental oil spills

No.	Equipment, materials and devices	Quantity

All equipment indicated in the table is stored at oil pumping station "_____".

Distance from the oil-pumping station to the crossing along highway is _____ km.

The method for delivering equipment and people to the region of the crossing is by road or by helicopter.

Time required for delivering equipment and people by road _____ .

Procedure for collecting the machinery and people and the route to the accident site, as well as their deployment at the location of operations:

Person responsible for storage and delivery of equipment:

4.2 Measures for localization, collection and disposal of accidental oil spills

4.2.1 General information

1. Oil volume in main pipeline run _____ m^3
2. Oil volume in reserve pipeline run _____ m^3
3. Oil volume piped across the crossing per hour under maximum productivity mode _____m^3
4. Calculated maximum possible volume of anticipated oil flow.

4.2.2 Scenarios of emergency situations at high water

4.2.3 Scenarios of emergency situations at low water

4.2.4 Planned emergency oil spill liquidation (EOSL) boundaries

EOSL boundary No.	No. 1	No. 2	No. 3	No. 4	No. 5
Travel time from the oil pumping station "_____"					
Estimated time of approach of head of oil slick during high water period					
Estimated time of approach of head of oil slick during low water period					

Addendum. Site plan with EOSL boundaries on the water area of the river _____ and travel routes from the oil pumping station "_____".

4.2.5 Procedures for personnel in response to an accidental oil spill at the underwater crossing

4.3 Passport of emergency oil spill localization (EOSL) boundary

(name of nearest population center)

1. Location of EOSL boundary

2. Route description and travel time study to the EOSL boundary from the oil pumping station and other EOSL boundaries.

3. Maximum speed of surface current at the boundary at high and low water.

4. Chart of EOSL boundary.

5. Emergency equipment used at the EOSL boundary.

Equipment	Quantity	Purpose

6. Emergency rescue station personnel actions at the EOSL boundary.

No.	Personnel action	Performance time

4.4. Procedure for organizing and performing emergency rescue operations at an underwater crossing

4.4.1 Elimination of emergency with loss of sealing

4.4.2 Elimination of emergency without loss of sealing

5. Comments and proposals by officials and inspectors regarding the information set out in the passport

Full name, position	Comments and proposals on maintaining the passport