2002/LV/16/P/PE/009

ANNEX I

ENVIRONMENTAL INTEGRATION MEASURES

PART A – ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Directive N° 85/337/EEC - OJ N° L175, 5/07/1985, as amended by Directive N° 97/11/EC – OJ N° L073, 14/03/1997.

Is consent from a government authority required for this project?

Yes [X] No [ ]

If yes, what is the competent authority?

The relevant requirements regarding developments that require EIA, for the schemes under consideration in this application are groundwater abstraction and construction of WWTP. The Law on Environmental Impact Assessment in Latvia states that EIA is required for groundwater abstraction in excess of 500,000 m^3 per annum, and for construction of treatment plants exceeding 30,000 p.e. Regional Environmental Boards (REB) are having rights to request EIA study for activities that are not included in compulsory list but may have a considerable impact on environment.

As annual raw water abstraction in Rezekne exceeds 500,000 m^3, an EIA study is ongoing for water abstraction and treatment technology.

2) **Has consent already been given to this project?**

Yes [X] No [ ]

(i.e. has the decision that will allow for the start of any construction works been taken?)

If yes, on which date? |_28_|_11_|_2001_|

If not, for which date is this decision scheduled? |___|___|___|

At this stage only valuation of environmental impact shall be undertaken. The decision on site suitability of the new well field development and suitable water treatment technology was taken on 28th November 2001.

During preparation of the Tender Documents and elaborating Employer's Requirements, the consultant with the assistance of the municipality will have to receive the technical tasks from number of organisation as well as agree with them the outline and detail designs. These organisations are the following:

- Planning and architecture requirements (issued by Municipal Council Architectural department);
- Ecological requirements (issued by Regional Environmental Board);
- Sanitation-hygienic requirements (issued by Environmental Health Centre);
- Electricity supply technical parameters (issued by electricity company Latvenergo);
- Water supply and sewage technical parameters (issued by municipal water services enterprise);
- Communication technical parameters (issued by telecommunication company Lattelekom);
- Fire-safety technical parameters (issued by State Fire-safety and rescue service).

The construction permit can be obtained when the detail designs are approved in the State Building Expertise.

3) Is the project a class of development covered by:

Annex I of Directive 85/337	☐	(go to question 4)
Annex II of Directive 85/337 (97/11)	☒	(go to question 5)
Not covered by Directive 85/337 (97/11)	☐	(go to question 8)

4) When covered by Annex I:

In case consent has been given, include the necessary documents.[3]

Yes ☐ No ☐

If yes, include the necessary documents. [3]

5) When covered by Annex II, is an environmental impact assessment required for the authorisation of this project?

Yes ☒ No ☐

If yes, and consent has already been given, include the necessary documents. [3]

EIA is not requested for the whole project but only for water abstraction and treatment. The objectives of EIA are the following:

- To analyze for planned activity requirements of environmental protection normative acts;
- To describe city water system;
- To motivate necessity of new water abstraction site;
- To describe the proposed site of water abstraction and sanitation belts;
- To describe technology of water abstraction;
- To analyze alternatives of technology;

---

3 the necessary documents are described in note 1 at the end of this Annex

- To analyze environmental impact during construction and operation;
- To analyze potential impact of new water treatment plant to society;
- To prepare different technological and organizational solution for environmental impact decreasing;
- To prepare recommendations for any activities in sanitation zones and for elimination of pollution risk of potential pollution sources.

The State EIA Bureau has approved the Environmental Impact Assessment Report. The site is found suitable for the well field and construction of iron removal plant. (English Summary included as Annex G).

If yes, but consent has not yet been given, has an environmental impact assessment already been carried out?

Yes ☐ No ☐

- If yes, include the necessary documents.[3]
- If not, when is this assessment likely to be prepared?

6) Have the environmental authorities likely to be concerned by the project by reason of their specific responsibilities been designated and consulted?

See answer 5.

7) Has the request for development consent and the environmental impact assessment study been made available to the public, and has the public concerned been consulted?

The first meeting was informative on subject before the decision on EIA. The second meeting was held on 1st June to introduce public to the draft final report (see minutes attached in Annex G).

8) When not covered by the Directive, or in the case of an Annex II project for which an EIA is not required, is the project likely to affect an environmentally sensitive area[4]?

Yes ☐ No ☒

If yes, attach one of the two following documents:

a) The attached questionnaire (Annex Ia)

b) A declaration (Annex Ib) by the responsible authorities for nature conservation stating that the information asked for in the questionnaire has been submitted to them and that their conclusion is that the zone's environmental potential will not be directly affected by the project.

If not, attach a scale map and a declaration (Annex Ic) by the responsible authorities that the project is not situated in a zone which is sensitive from an environmental point of view and that it will not have significant negative effects on water, air, soils, landscape, flora, fauna and cultural heritage.

---

4 for a definition of environmentally sensitive areas see note 2 at the end of this Annex

PART B – ENVIRONMENTAL PLANNING, MANAGEMENT AND MONITORING

1) **Indicate whether, apart from the Environmental Impact Assessment, any environmental integration measures are envisaged (eg. strategic environmental impact assessment or environmental audit)**

Yes ☐ No ☒

2) **Will the measure be subject to environmental management and/or monitoring?**

Yes ☒ No ☐

If yes, please specify:

Groundwater monitoring on water abstraction quantities is carried out by Regional Environmental Boards. Information is transferred to the Environmental Agency for further analyses and reporting. Ground water quality monitoring is carried out by the Geological Survey. Samples are collected by technicians from the Geological Survey in a special developed field laboratory vehicle, and samples are forwarded to the certified laboratory at the Hydrometeorological Agency.

Drinking water quality monitoring is maintained by the Regional Environmental Health Centres. Samples are taken by technicians from the Health Centres at inlet to public water supply networks, drinking water hydrophors, free accessed taps and inner taps. Information is analysed at laboratories at the Health Centres. Analyses results remain at the Health Centres and information on compliance with the standards are sent to the National Environmental Health Centre.

Wastewater effluent monitoring is carried out by the Regional Environmental Boards four time a year as single effluent analyses. Parallel to this the owner of the plant is also undertaking sampling of influent and effluent sewerage but these date are not transferred for further analyses, and exclusively used only for plant efficiency determination.

Wastewater sludge quality monitoring is requested by the Environmental Authorities once a year. It is carried out by the accredited laboratory and paid by the water enterprise.

The surface water monitoring is carried out by the Latvian Environmental Agency.

Bathing water quality monitoring is undertaken by the Environmental Health Centre. In general the Centre is monitoring only official bathing sites along the Riga Gulf and the Baltic Sea. However, if agreed with the municipality, the local departments of Environmental Health Centre are taking samples of commonly used municipal bathing sites. More detailed information of each town is given in the Appraisal Report, chapter on Environmental Quality.

More detailed information on monitoring system is presented in the Annex II.

Notes to Annex I

1. Necessary documents are:

a) The non-technical summary of the environmental impact study;
b) The results of consultations with the designated environmental authorities;
c) The results of consultations with the public concerned.

Note: In relation to b) and c) these may be represented in the form of a statement, conclusion or certification by the designated environmental authority, indicating in what way the concerns of the designated consults and concerned public have been taken into account.

2. Definition of environmentally sensitive areas:

1. Areas protected by national legislation;
2. Internationally important wetlands (sites fulfilling RAMSAR convention ornithological criteria) and other sites meeting the criteria which would require designation as Special Protected Areas under Directive 79/409/EEC;
3. Areas to which the Bern convention on the conservation of European wildlife and natural habitats (Article 4) applies, in particular sites meeting the criteria of the Emerald network;
4. Breeding or resting places of an animal species listed in Annex IV of Directive 92/43 EEC (Article 12).

3. Designated map scales for use with applications for ISPA Assistance:

Use approximately: ***1:100.000***

G SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT REPORT

EXECUTIVE SUMMARY

The principal objectives of new Wellfield Construction Project shall be as follows:

- to increase the quality of water supply services up to the level meeting the requirements of Latvian drinking water standards (particularly with regard to contents of iron, manganese and fluorine);
- to enhance accessibility (coverage) of water supply services by improving and enlarging the pipelines and utility equipment;
- to increase the sanitary level of water supply systems by making the water supply operations free of aged artesian boreholes which are used in non-centralized water supply and whose sanitary and technical condition fails to meet the up-to-date requirements;
- to contribute to performance by Latvia of obligations under the Helsinki Convention.

The a/m Project objectives shall determine ***the following objectives to be achieved by Environmental Impact Assessment (EIA)***:

- to evaluate *new wellfield construction project* for primary and secondary negative and positive impacts that might be exerted on all environmental constituents during construction and operation of the facility;
- based on the impact assessment results, to define technological, construction and building suggestions for feasible restraint or avoidance of undesirable impact, and to support development of environmental requirements and achievement of Project's principal objectives.

Justification of Wellfied Location Choice

The results of preceding research efforts show that the most suitable location for a new wellfield shall be in the area of 1.5 km east of Rezekne (Dreizu Village, Griškānu Pagasts, Rezekne Region). The site of 7.7 ha surface area planned to be used for construction of the said wellfield was assigned in 1993 to Rezekne City Hall's Urban Economic Department.

The new wellfield location choice is justified by a number of factors, such as:

- *Plavinas-Daugava aquifer series*' piezometric level depression in the observed north-west direction; water runoff from the said series is carried to the rivers of Daugava, Aiviekste and Malta; therefore, having the water intake facility located in the area where the horizon series used for water supply has the highest piezometric levels shall result in the lowest water output operation costs;
- in the area selected, *Plavinas-Daugava aquifer series*' filtration parameters have the highest values (km=5000 m^2/day), with a relatively shallow and gently sloping depression cone to be formed in the course of the wellfield operation;
- *Plavinas-Daugava aquifer series*' is overlaid by quaternary sediments of poor penetrability to water (morainal loam and sandy loam), whose thickness varies from 30 m to 50 m; thus, sufficient isolation shall be ensured for the aquifer series in the course of the wellfield operation;
- shallow depth and gentle slope of the depression cone as borehole as low filtration parameters of the Quaternary sediments overlying the subsurface aquifer

series make any deleterious effect of the planned wellfield on the groundwater level to be rather improbable;

- the planned wellfield site has a hilly relief, the absolute elevation above the sea level varying from 141.8 m to 156.3 m; the planned wellfield route is intended to get arranged as a comparable slope area, with the absolute elevation above the sea level not to exceed 143.0 m;
- the planned wellfield site has no large communities in its vicinity; Rezekne (over 10 000 inhabitants) is 1.5 km away; 200 m away is the Rezekne-Ludza motor road (asphalt surfaced) of the state significance and in good condition, with the sites of an iron removal station (construction just started) and water supply boreholes (being designed) interconnected with purposefully built access roads;
- as far as in 1986, *Vodokanalproiekt* Project Design Institute prepared all the documents required for Rezekne Centralized Water Supply arrangement; in 1989, in the framework of this Project, construction works were commenced for building wellfield and iron removal plant, and then suspended due to insufficient financing; for the present, 7.4 km of 400-mm diameter trunk water pipeline have been built, 20-30% of iron removal plant have been installed, 10 water supply borehole sites have been prepared, and a dirt road has been laid along the trunk route; the works completed by 1989 have been commenced to get partially renewed.

Potential Pollution Hazardous Sites

Potential pollution hazardous sites within the wellfield effect zone shall be classified as follows:

- handling areas of hazardous materials and other pollutants, such as oil products, agricultural chemicals, farming wastes;
- areas which may contribute to faster penetration of pollutants unto artesian waters, such as abandoned or damaged or poorly maintained water supply boreholes and quarries.

The survey results show Category 1 potential pollution hazardous sites (cattle farms, oil depot, motor filling station, agrochemical storehouse) may affect the environmental quality at a local scale, i.e. adjacent surface water sites, such as amelioration waters, soil and groundwater surface beds. Deleterious effects on the operated aquifer water quality through infiltration are actually excluded, thanks to a very high natural protection level as shown in 1992 by a research survey of emergency flows from Spruževas Oil Depot site.

Technically damaged artesian boreholes located nearby, as they are serving water in the aquifer along the pollutants migration path, may cause pollution of the operating aquifer. Thus, strict performance of the technical requirements is imposed as regards boreholes located in the wellfield effects zone.

Water Intake Protection Zone Requirements

Strict Protection Zone width shall be determined using the water penetration degrees of the aquifer overlying rock thickness. In Borehole No 11459 (Borehole No VGD in Boreholes Database), the total Quaternary sediment thickness is 28.7 m, with 15.8 m therein being moraine loam with low penetrability to water. Therefore, conforming to the Protection Zone calculation techniques shown in page 8.1.3, the Protection Zone width shall be 10-30 m (20 m on an average).

Bacteriologic Protection Zone width shall be calculated. For this purpose, use shall be made of the lifetime of microorganisms in subterranean water flows. For pressurized water, this lifetime amounts to 200 days. Bacteriologic Protection Zone calculations show that, even in the most favorable conditions, microorganisms found in the aquifer surface layer reach the lifetime, which exceeds the permissible time span. Thus, it may be considered that the water intake site is protected from bacteriologic pollution, and no special protection zone is required.

Chemical Protection Zone calculation using a special-purpose program has been made by the State Geological Survey. Its surface area is 4764 ha. The calculation does not take into account pollutants' physical and chemical properties. It means that the Chemical Protection Zone width as currently defined is wider than required. However, in order to have the Chemical Protection Zone width calculated with due account for the said pollutants' properties, special research efforts would be needed to define these parameters.

Integrated Water Treatment Plant

In the new centralized artesian water intake system, water contains excessive quantities of iron - 1÷3 mg/l (standard limit 0.2 mg/l) and manganese - 0.1 mg/l (standard limit 0.05 mg/l).
It shall be necessary to bring the iron and manganese concentrations in water down to the a/m standard limits prior to water supply to consumers.
The overall town water supply process chain shall be as follows: From four artesian boreholes (3 operational, 1 stand-by) with total output of 11500 m^3/day or 480 m^3/hr, water shall be supplied to the Integrated Water Treatment Plant in Zilupes Street, opposite to the Flax Processing Factory. The Integrated Water Treatment Plant shall comprise a water iron removing unit and a Mn concentration decreasing unit, two above-ground treated water reservoirs of 2000÷2400 m^3 total capacity (used for water flow rate non-uniformity adjustment), water disinfection units, and a second booster pump station for water delivery into the town water supply network.

This Integrated Water Treatment Plant is planned to position on the existing construction site in Zilupes Street, where in 1980 construction of a similar plant was started, with the Project design and development made by LENINGRADSKIY VODOKANALPROIEKT Design Institute, to support water output at the rate of 27000 m^3/day. Construction works were performed to 20-30% and then suspended because of insufficient financing.

The applicable new technology, water treatment plants, auxiliary units, above-ground reservoirs and second booster pump station could be accommodated in a single building. Auxiliary units, i.e. disinfection station and boiler house, could be also accommodated in separate buildings.

This Integrated Water Treatment Plant could be compactly erected on a site amounting to 1/4÷1/5 of the initial construction site.

The following methods could be used for water iron removal and Mn concentration decreasing purposes, namely:
1. Aeration and filtration method (using open filters or pressure filters); up to now, water iron removal method was mostly used in Latvia;
2. Chemical oxidation method;

3. Alkalization and settling (floatation method); presently, this method is used in Cesis;
4. Ion exchange method;
5. Surface oxidation method;
6. Biologic iron removal; presently, this method is used in Dobele and Liepaja.

To find the method of the lowest environmental impact, a classical *checklist* technique was used. Each method was assigned a value of 1 to 5 points; the higher the value, the lower its environmental impact. Among the a/m methods, the lowest environmental impacts were exerted by the surface oxidation method (5) and biologic iron removal (6). Which of the above two methods is more suitable for the conditions of Rezekne could be verified using a pilot experimental unit.

In practice, the choice shall be made out of the two iron removal methods listed above:

- Surface oxidation method (tested in numerous facilities);
- Biologic iron removal (a comparatively new technique).

Water Disinfection. By microbiological indices, water in the centralized water intake facility meets standard requirements. Disinfection shall be required only from time to time, whenever water pollution occurs in the open iron removing filters and aboveground reservoirs due to any unforeseen cause. Water disinfection shall be performed using sodium hypochloride solution, which shall be supplied in tanks and pumped by a proportioning pump to disinfection points.

Sewerage. Operation sewerage and polluted process water shall be canalized to the town sewage header ø300 mm in Zilupes Street, extending the same to the construction site by L~0.3 km.

Rain Drainage. Rain and thaw waters shall be drained from the Integrated Water Treatment Plant site into an open ditch assigned to the said site and then, in appr. 350 m, discharged in the Rezekne River. By their analysis, these waters shall be close to natural surface runoff from clean sites, since the said site shall be kept in cleanness and due order, in sanitary terms. The said ditch shall be also used to receive reservoir overflows and emptying effluents.

Reservoir and water supply line disinfection waters shall be discharged into the town sewerage.

Protection Zones of Buildings and Networks. Conforming to the Act of Protection Zones, no sanitary protection zones shall be defined to water treatment for buildings, above-ground reservoirs, pump stations and the water supply and sewage networks, and only operation protection zones shall be set for these purposes.

According to the Republic of Latvia Regulation No 168, the following protection zone dimensions shall be used:

- water treatment protection zone for buildings, above-ground reservoirs and pump stations - 5 m from outer walls of such buildings, with such protection zones to be fenced;
- along water pipelines - 5 m to either side from a pipeline;
- along gravity sewage lines - 3 m to either side from a pipeline. Operation protection zone limits shall be defined conforming to the Act of Protection Zones.

New Wellfield Impact on Levels and Reserves of Artesian Waters and Groundwaters

Groundwater level depression resulting from the water intake shall produce the so-called depression cone with the maximum depression in the center and gradual depression decrease with increasing distance from the water intake points. Such depression cone shall be formed in the Plavinu-Daugava aquifer used. If water inflow is observed from the overlying aquifer into the one used, gradual water level depression may be formed in a higher occurring aquifer (groundwater) as borehole.

Water level depression in the Plavinu-Daugava aquifer of the Rezekne bedding may endanger only those aquifer operation boreholes, which are located in this site. Such impact on the use of boreholes may occur only within a limited area where the water level depression exceeds 4 m. No impact of the kind may be produced at lesser water level depressions to cause their withdrawal from operation, since natural level variations of the Plavinu-Daugava aquifer exceed 2 m.

According calculations of the groundwater reserves, in the Plavinu-Daugava aquifer within the own wellfield district (water intake points), water level depressions are about 5.7-5.8 m. Mathematical simulation techniques allowed to define an area wherein water level depression in the Plavinu-Daugava aquifer exceeds 4 m. This area covers appr. 669 ha. According to the materials collected by the State Geologic Service, this area includes one Plavinu-Daugava aquifer operation borehole (DB 13751). Predictive calculation of probable groundwater level depressions shows that, in the worst case scenario for 25 years period of time in the area where the Plavinu-Daugava aquifer depression exceeds 4 m, the maximum groundwater level depression may reach 1.6 m.

The area where the foreseen groundwater level depression exceeds its natural variation amplitude is 660 ha. In this area, there is an individual single-farm family garden cooperative in the suburb of Rezekne, as borehole as Griškanu Village with about 15 families living there.

In this area, there are individual single-farm water supply wells using Quaternary aquifer water and, to a lesser extent, the Plavinu-Daugava aquifer water. For single farms, there are 20 wells and 8 boreholes (two boreholes reaching the Quaternary aquifer, and six operating in the Plavinu-Daugava aquifer).

The water layer thickness in wells varies from 1.0 m to 2.87 m, with level depressions fluctuating from 2.0 to 2.42 m. In view of the above, well shall have to be deepened by 2-2.5 m upon completion of the water intake system. Data relating to the wells to be deepened are summarized in Annex 3; still, the list will be defined more accurately based on the monitoring results.

To support groundwater protection against running out in sections where groundwater level depressions exceed permissible limits as shown in the reserve calculation schematic, and against pollution (water quality variations) in the course of the intake operation, it shall be necessary to provide for monitoring of subsurface waters (including groundwater) as a means of control and operating adjustment.

New Wellfield Impact on Surface Waters

The Rezekne River's mean annual modulus of flow is 6.3 l/s/km^2, ensuring inflow of both surface and subsurface waters. The subsurface water inflow volume may be approximately compared with the Rezekne River's minimum outflow in a low water period. According to the data collected by the hydrologic station in the vicinity of the Rezekne city, 95% surety shall be 0.18 m^3/s for the summer/autumn low water period flow rate and 0.23 m^3/s for the wintertime low water period flow rate. For subsequent calculations, the subsurface water flow rate shall be assumed to be 0.23 m^3/s.

The Rezekne River originates from the Lake of Kaunatus. The River headwater is appr. 15 km away from the planned wellfield center. The riverbed length from the headwater up to the a/m hydrologic station is 21.7 km, the Quaternary water inflow here being 10.6 l/s/km^2. The maximum calculated Quaternary aquifer water level depression (2.0 m) in the rocks forming the Rezekne Valley banks should be expected to be north of the planned water intake. In the River head, the calculated level depression shall not exceed 0.8 m.

In view of the above, it may be said that the water intake will decrease the Quaternary aquifer water inflow volume. The calculated results show that, in view of the decreased groundwater flow volumes, the River flood volume will get reduced appr. by 20% in the low water period. Therefore, in the hydrologic station area, the flood rate will be possibly decreased by 0.0046 m^3/s, and the flood volume in the winter low water period will be 0.184 m^3/s.

New Wellfield Impact on Hydraulic Amelioration

In a deployed hydraulic amelioration system, drainage shall be principally controlled by gravity water layers enclosed between the soil surface and the first water impermeable key bed. In soils of low permeability, gravity water is also maintained at gradually decreasing water permeability in soil depth, but without explicit water impermeable key bed. The principal objective of drainage shall be a faster groundwater level depression in the subsoil layer in the springtime thawing/presowing period. To make up for it, in the summer time vegetation period, the groundwater level usually drops down below the drain piping level (and as inhabitants say, water disappears in single-farm wells nearby). Draining ditches get drained into water discharge drainage and surface water runoff, whereas loop ditches get outflown into flood surface discharge. Since in spring time the soil is saturated with melting snow, ice and rain water, drainage is operating independently of the water impermeable key bed and groundwater levels, whereas in the vegetation period there is no such soil saturation and the groundwater level is normally below the drain piping level.

While analyzing the hydro geological and hydrological situation, existing hydraulic amelioration systems and predicted subsurface water/groundwater level depression, it should be noted that Rezekne Wellfield will actually cause no essential impact on operation of the hydraulic amelioration systems and will not deteriorate the soil humidity regime in the adjacent land areas.

Probable Impact on Ambient Air

In the water intake construction vicinity, the ambient air pollution background level is mainly made up by:

- motor vehicle exhaust gases, as there is the Rezekne-Ludza motor way not far from the construction site;
- single-farm housing chimneys;
- tuberculosis hospital's boiler house;
- ceramics factory (currently operated under a minimum load);
- flax processing factory which is currently operated under a minimum load and which used to have problems with flax dust discharges;
- predominant West winds (from the town of Rezekne).

The calculations performed unambiguously prove that:

- discharges of boiler cleaning products into atmosphere are not dangerous to human health;
- fuel type used may be selected as a function of economic or other factors;
- from environmental point of view, the first choice shall be the use of wood wastes, since the impact would be minimum in this case, and the utilization problem of wood wastes would be solved at the same time.

Impact on Biodiversity, and Productivity of Agricultural Lands and Forests

Groundwater contained in the moraine is linked to sand/gravel inclusions. The thickness of these sand/gravel inclusions and rarer streaks is below 8.2 m, and their spreading is limited. Sand/gravel inclusions comprise pressurized (or, in rarer occasions, slightly pressurized) water, its level being at the depth of 1.5-10.0 m. This is clear evidence that groundwaters do not make up a single groundwater aquifer in the water intake vicinity.

The soil humidity conditions are controlled by the hydraulic amelioration system drainage; this applies to the gravity aquifer, which is enclosed between the soil surface and the first water impermeable bed (moraine). It means that, once the water intake is provided, the soil humidity conditions and surface runoff in the west part of the protection zone shall be still controlled by the hydraulic amelioration system drainage, whereas those in the eastern part shall be determined by the unified hydrologic system of the Rezekne River, lakes and marshes.

The above reasoning shows that the new wellfield operation will probably result in limited and fragmentary impact on groundwater. There will be no impact on biodiversity and productivity of agricultural lands and forests.

Evaluation of Necessity for Changes in Use of Land in Construction Sites

Conforming to Griškānu Pagasts Council's resolution (Reference Note No 189), the land of 7.74 ha total surface area in Dreizu Village, Griškānu Pagasts, Rezekne Region has been assigned to Rezekne City Hall's Urban Economic Department for construction of a wellfield. It means that arrangement of boreholes will require no additional changes within the land property borders.

Within the span from the iron removal plant to the town networks, old water supply pipelines shall be eliminated and new lines laid (appr. 1.1 km of length), new water supply pipelines could be positioned in old places with no agreement needed on the part of land owners, since operational protection zone and restrictions are still legally binding on land owners. In this case, no tree cutting shall be needed in the said span, and no additional inconvenience shall be produced.

Water supply pipeline span from the wellfield to the water treatment facilities was already built in 90s, but later the pipelines were dismounted and used for other applications. Within this span, a new trunk line of about 1.2 km of length shall be built and laid along a new route. This will require agreement on the part of landowners, Pagasts architects, governmental authorities and other parties concerned. Definition and proper agreement for the new route shall be performed at the next Project development stage, i.e., within the engineering design framework.

Problems and Inconvenience in Use of Land as Relating to Protection Zone Restrictions

As mentioned above in the preceding Sections, the maximum impact area (depression cone) may have subsurface water level depressions produced to cause negative effects on land management.

Level depression in the Plavinu-Daugava aquifer series could cause no negative impact on single-farm inhabitants, because of a very high water output potential. This applies to single farms where the said series water is used. This conclusion is also supported by the fact that, despite a long-time use of the series for water supply to Rezekne (with a higher load in the recent past), no problems were encountered as regards water disappearance in wells fed by the Plavinu-Daugava aquifer series.

The existing wells are planned to deepen so as to provide other consumers with water quantities required (see Section "Probable Wellfield Impact on Levels and Reserves of Artesian Waters and Groundwaters").

Serious conflict situation may arise in wellfield operation as regards relevance and necessity of the Plavinu-Daugava aquifer series protection against pollution. In view of the fact that the water saturated rocks here are cracked dolomites where through any pollutant migration rate may be very high, it shall be necessary to prevent any probability of pollutant penetration in the series operated and then in wellfield boreholes. In other words, all potential pollutant places shall be subject in full extent to all environmental control requirements following from the environmental legislative acts.

Monitoring Required

The principal environmental constituents that might be possibly affected by operation of the Rezekne subsurface water intake (in volumes which may be evaluated by instrumental aids) shall subsurface and surface waters. Expected effects include impact on hydrodynamic characteristics of the subsurface water and, to a lesser degree, on surface water runoff.

For the subsurface water basin in Rezekne site, it shall be necessary to ensure subsurface water quantity/quality monitoring for the purposes of using the Plavinu-

Daugava aquifer as a water supply source, conforming to the approved water reserve usage scheme. In this scheme using three boreholes, level measurements shall be performed in both operating and stand-by holes.

The quality control of the water produced in operating holes and water pipelines shall be run in compliance with the Ministry of Welfare's requirements.

An observation borehole network shall need to be deployed in order to assure evaluation of actual subsurface water level depression and quality variations as a result of water pumping out of the Plavinu-Daugava aquifer and groundwater layer. The number of holes required shall be four; they have commenced to be laid out as shown in the schematic appended.

The observation holes shall be located downstream of the wellfield's upper watershed, with the first hole to be positioned in the wellfield center and the second one to be bored within an area covered by the probable 4 m level depression and at a distance of 1 km away from the first observation hole. Adjacent to Plavinu-Daugava aquifer observation holes, groundwater observation holes to ensure monitoring groundwater level depression and groundwater quality variations.

Surface Water Monitoring. During operation of the subsurface wellfield, there exists a theoretical possibility of groundwater level depression which might be followed by a decrease in the groundwater drainage volume; still, in view very low Quaternary sediment filtration parameters, the probability of volume decrease and any impact on surface water runoff volumes is negligible. Therefore, there is no need in quantitative surface water monitoring.

Surface water quality monitoring shall be mandatory, because its results yield information on total (rocks, soil, and groundwater) pollution level and the protection zone pollution trends, thus enabling timely operational steps to be made for minimizing any negative impact.

Surface water runoff in the protection zones is basically accumulated in amelioration ditches; thus, water samples taken from the amelioration ditches provide full picture of the protection zones' sanitary state. Surface water quality monitoring shall be recommended to perform by taking 3 samples from amelioration ditches in the essential impact zone (4 m level depression) and partially in the chemical protection zone. Water samples shall be taken twice a year, at the snow thawing time when the surface water runoff is at maximum, and in summer time when the surface water runoff is at minimum.

Engineering and Technical Steps to Minimize Environmental Impact

The engineering and technical steps as well as recommendations provided for in the subsequent Sections shall apply only to local areas where negative impact on the environment and inhabitants may be discovered as based on theoretical considerations. It should not be forgotten that the wellfield's positive impact will be much more significant and will involve a large territory (the town of Rezekne included) to provide considerable improvement of the social sphere for tens of thousands inhabitants as well as sanitary improvement of the town's territory, thus providing prerequisites for better environment. It means that implementation of the

Project will make important contribution to bringing together two antipodes, i.e. Big City and Human Environment.

Construction of the new wellfield in Griškānu Pagasts territory will provide utterly important prerequisites for improvement of social services rendered to inhabitants, by making possible connection to the centralized water supply and sewerage. Economic and financial prerequisites shall be also positive, since there will be no need to build their own wellfield, with the second Rezekne wellfield construction phase (enlargement of utility networks) offering a connection opportunity.

The above considerations lead to the conclusion that the construction of new wellfield shall be, in a broad sense, a step forward in improvement of environment.

Principal engineering and technical steps to minimize environmental impact shall be as follows:

1. The wellfield scheme selected shall provide the following advantages allowing to minimize environmental impact, namely:

- the design borehole depth exceeding 100 m will support lesser piezometric level depression and resulting lesser depression cone in groundwater;
- cementation to be made between and beyond pipelines in the Quaternary and Plavinu-Daugava aquifer series shall prevent off-standard groundwater from penetrating the aquifer operated.

2. Provision of a strict protection zone around each operating borehole rather than along the entire wellfield line shall not affect animals' migration and shall not cause biotope fragmentation.

3. Provision of water supply pipelines running from the iron removal plant up to the town networks, instead of old lines, shall make use of already agreed upon routes to exclude any additional inconvenience and restrictions in the use of land by land owners and managers.

4. Use of wood wastes for heating in the iron removal plant shall allow to minimize atmospheric pollution and to decrease the environmental load of wood processing waste storage on adjacent sites.

5. Delivery of washing water from reagent containers, pumps and filters to the town's disposal facilities shall cause no local pollution load on the water intake's adjacent sites.

Recommendations for Minimizing Possible Environmental Impact

1. To provide water supply to single-farm inhabitants in the maximum groundwater level depression area (660 ha) where possible water disappearance in wells is predicted. It is also advisable to proceed with water well deepening in accordance with the calculations appended.

2. To provide, in collaboration with the Rezekne Regional Environmental Board, proper arrangement of single-farm and enterprise boreholes using the Plavinu-

Daugava aquifer series (strict protection zone management, technical condition monitoring of wells, survey of polluted sites and particularly of farm lands).

3. To plan technical and sanitary state evaluation of all decentralized and centralized water intake boreholes, with the objective of arranging or eliminating those not in use or those failing to meet relevant environmental control requirements, so as to prevent any pollution peril for artesian wells and to improve sanitary conditions in the Rezekne city.

4. To insure continuous wellfield monitoring for impact on the subsurface water level and quality, and to provide prompt adjustment of the same in conflict situations (if any).

5. To support quality control of potable water.

6. To provide, in collaboration with the Rezekne Regional Environmental Board, line washing water discharge into amelioration ditches at the iron removal plant and into the Rezekne River upon connection to the town networks.

7. To agree with all institutions and landowners concerned upon new water supply pipeline routes from the wellfield to the iron removal plant.

8. To arrange water supply pipelines and back-filling of the same with excavated soil. This will minimize the routes' impact on natural groundwater flows. To ensure land recultivation after the line back-filling.

9. To avoid fencing of the operation protection zones along water supply pipelines (from the wellfield to the iron removal plant). This will prevent intrusion in animals' migration, and biotope fragmentation.

Republic of Latvia Ministry of Environment Protection and Regional Development

STATE ENVIRONMENTAL IMPACT ASSESSMENT BUREAU

Reg. No 90000628077, 23 Rupniecibas Street, LV-1045 Riga (Telephone: 7321173 Fax: 7321049)

R i g a

STATEMENT

on the environmental impact assessment final report for establishment of the ground water source and preparing of water for centralised water supply

Valid until 28.11.2004

Issued to the initiator of the planned activity: **Rezekne municipality non-profit water and sewage company "Ūdenskanāls", address: 16 Pils Street, Rezekne, LV–4600, reg. No 000321861.**

Name of the planned activity: **Establishment of the ground water source and preparing of water for centralised water supply in the city of Rezekne.**

Location of the planned activity: **Rezekne region, Griskanu parish, Dreizu village.**

1. Short description of the planned activity

It is necessary to establish a new source of ground water in Rezekne city in order to create a unified centralised water supply system. Currently the water supply company "Ūdenskanāls" operates four independent water supply systems:

1) "Centrs" with a water tower with a capacity of 150 m^3 and height of 20 m, length of network 67.6 km;
2) "Ziemeļi" with a water tower with a capacity of 200 m^3 and height of 27 m, length of network 15.8;
3) "Austrumi" with a water tower with a capacity of 80 m^3 and height of 28 m, length of network 5.2;
4) "Dienvidi 1" with a pressure tank of 20 m^3, "Dienvidi 2" with a tank of 30 m^3, length of network 7.3 km, equipped with iron removal device.

From the sources of water operated by the water company, except the source of water "Dienvidi 1", the water reaches the consumers without any preparation. The capacity of

the existing water towers is small and their pipelines are in a bad technical condition. Most of the water distribution network was installed 30-40 years ago.

About 30% of the Rezekne inhabitants use shallow wells or decentralised wells belonging to different operators. Most of the private houses for their water supply use quaternary level wells that are 3 – 12 m deep. Water in these wells does not comply the requirements for drinking water due to high content of iron and manganese.

In order to ensure the supply of good quality water in Rezekne already back in 1967 to the east from the city, on the territory of the Dreizi village hydrogeological examination was carried out and the water supply for the deposit "Rezekne" was estimated – 38 700 m^3/24h. The new source of water is situated 1.5 km from Rezekne. Taking into account the potential growth of industry the forecasted water consumption in Rezekne is 10 300 m^3/24h. In order to satisfy the given water supply it is necessary to install 3 water supply wells with the total capacity of 150 l/sec, using the Plavinas-Daugava aquifer water levels. The water is typical for Latvia - hydrogenised carbonate calcium-magnesium fresh water, that in general meets the requirements for drinking water, but it has high concentration of iron and manganese. Concentration of iron and manganese exceeds the future (2015) harmlessness requirements for drinking water in Latvia; therefore it is necessary to perform iron and manganese removal. In the environmental impact assessment report there are seven alternative water quality improvement methods review:

- ✓ Aerifying method, when oxygen is dissolved in water, and it oxidizes the soluble bivalent iron ions into insoluble triad iron colloids. It is not possible to reduce concentration of manganese ions in water. Besides it requires regular rinsing of the filters; the sludge is particularly disperse and difficult to dehydrate.
- ✓ Chemical oxidising method, which is similar to aerifying method, but the oxidizing agent used is stronger – chlorine gas or potassic hypochlorite, potassic permanganate, ozone, hydrogen peroxide. Advantage of this method is that both – iron and manganese is removed from the water and the bacteriological treatment is also ensured. Nevertheless using of ozone the concentration of biogenic sediment is increasing and that facilitates the growth of bacteria in the water supply network. The speed of corrosion also increases.
- ✓ Manganese dioxide catalytic method, where oxidizing of iron and manganese is catalysed by special filtration materials. If this method is used it is necessary to use high pressure and a lot of rinsing water. For some of the catalytic materials it is necessary to use water aerifying, for others a continuous regeneration of material with potassic permanganate is necessary which causes high consumption of agents.
- ✓ Iron removal – softening method. In this method sodium hydroxide is added to the water and as a result the iron and manganese ions are sedimented. In order to speed up sedimentation in the process of sedimentation or floating a coagulant is additionally added to water. There is much sediment, but it is rather easy to dehydrate it.
- ✓ Surface oxidizing method. Introduction of air before filters absorbs iron ions on the filter material and oxidizing on its surface forms a layer of iron hydroxide and iron oxide. It is also possible to reduce concentration of manganese ions in the water. If this method is used it is not necessary to have agents and a contact tank. Devices occupy small space. By using this method the water is not saturated with air and concentration of oxygen in it is low; consequently it is not aggressive towards water pipes.

- ✓ Ion exchange method. Its principle is to filter the water for treatment through the sodium cationite changing the manganese, iron and other cat ions for sodium ion. When the capacity of the cationite ion exchange is exhausted, the filter has to be rinsed and regenerated with a concentrated solution of common salt and rinsing requires a large amount of treated water. This method incurs quite high running costs.
- ✓ Biological iron removal method. It is based on the fact, that iron bacteria which is present in the artesian well waters in the presence of oxygen oxidizes the bivalent iron ions. The sediment produced as a result of the work of bacteria is with much higher density and it is easier to dehydrate it if compared to any other method. This is the greatest advantage of this method. Treated water normally contains less then 4 mg/l of dissolved oxygen and part of the biogenic material is eliminated with bacteria and therefore the water is less corrosive.

Comparing the water preparation methods it was assessed which of the methods have the least impact on the environment, namely, their efficiency and stability, consumption of agents, experience in using of the method in Latvia, water amount from rinsing, possibility to dehydrate the sediment, space occupied by the devices, energy consumption, impact of the produced water on the water pipes and stability of the water quality in the distribution network and bacteriological safety of the water.

Taking into account the fact that for assessment of the water quality in the Environmental Impact Assessment report water samples from only one well installed in the investigation area, we advise, in order to choose the optimum water preparation method, to state concentration of manganese ions in all wells of the new water source and further in engineering to review two alternatives:

- ✓ The biological iron removal method, which might be the cheapest from the point of view of investment needed;
- ✓ Surface oxidizing method, which is widespread, simple and used for many years;

Impact on the environment can be caused due to water extraction that might result in lowering of the ground water level. It is mentioned in the report, that impact on the groundwater level can be caused only in the case, if in the Plavinas-Daugava groundwater deposit (lying under the groundwater level) a long-term decrease, over 4 m, of the water level is formed. During the course of mathematical modelling (taking the worst hydrodynamic situation as the basis for calculation) the area, where such a water level decrease might happen during the 25 years of operation, is determined. That is a territory of 660 ha surrounding the water extraction place. On this territory after regular water extraction for 25 years with the total debt of 10 300 m^3/24h lowering of the groundwater level is possible and can reach 1.6 m directly in the place of water source and gradually decrease to the periphery of the area reaching 0.0 m on its outer border. At the same time it has been determined, that the calculated maximum groundwater level decrease cannot cause draining away of the surface water bodies or lowering of the water level in them. There are individual farms, gardening companies and Griskanu village situated on the above-mentioned zone. There are 20 wells and 8 artesian wells installed in the individual farms (see Final report, table 4.5.). Gardening societies use mainly surface water for watering purposes (12 consumers of water).

For maintenance of the necessary drinking water quality during the whole period of water extraction from the water source protective zones with a certain regime are created:

- ✓ Severe management protective zone;

- ✓ Bacteriological protective zone;
- ✓ Chemical protective zone.

Final report comprises information about the calculated protective zones and the determined activity restrictions in them according to the Cabinet of Ministers Regulations No 8 from 5 January 1999 – "Methodology for determining of protective zones around water sources". The chemical protective zone of 4764 ha is determined for the whole 25 year period of the water source using and it is situated in Rezekne and Ludza regions, but the bacteriological protective zone matches with the severe management protective zone and it is determined in the range of 20 m around each extraction well.

2. Evaluated documentation

1. Rezekne ŪKSP "Ūdenskanāls" request from December 13, 2000 No 01-14/ 321 for the environmental impact assessment Programme – 10 pages.
2. Programme for environmental impact assessment for the establishment of groundwater source for the city of Rezekne and water preparation for centralised drinking water supply – 5 pages 26.01.2001.
3. Working report of the environmental impact assessment for the establishment of groundwater source for the city of Rezekne and water preparation for centralised drinking water supply – volume 1, 142 pages with annexes (85 pages). SIA Ekosistēmas, Rēzekne 2001.
4. State Environmental Impact Assessment Bureau conclusion about the working report of the environmental impact assessment for the establishment of groundwater source for the city of Rezekne and water preparation for centralised drinking water supply – 7 pages.
5. Experts' conclusions about the working report of the environmental impact assessment for the planned activity – 16 pages.
6. Comment of the Rezekne Regional Environmental Board about the environmental impact assessment working report – 3 pages.
7. Minutes of the environmental impact assessment working report public discussion meeting – 5 pages, Rezekne, 01.06.2001.
8. Final Environmental Impact Assessment Report for the establishment of groundwater source for the city of Rezekne and water preparation for centralised drinking water supply – volume 1, 112 pages with annexes (96 pages) and graphical material. SIA Ekosistēmas, Rēzekne 2001, October.
9. Experts' conclusion about the Final Environmental Impact Assessment Report – 5 pages.
10. Comment of the Rezekne Regional Environmental Board about the Final Environmental Impact Assessment Report – 1 page.

3. Decision of the State Environmental Impact Assessment Bureau

Based on the analysis of the above mentioned documents, the State Environmental Impact Assessment Bureau recommends to the Rezekne municipality non-profit water and sewage company "Ūdenskanāls" to perform the planned activity – establishment of the groundwater source and preparing of water for centralised water supply in the city of Rezekne with the planned capacity of 10 300 m³/d.

4. Mandatory requirements and activities to fulfil further in the engineering process

1. Initiator of the activity in co-operation with the Rezekne region Griskani parish and Ludza region Cirma parish local governments have to ensure including of the new water source and its protective zones into the respective physical plans as well as to inform the people about restrictions of economic activity in the water source protective zones.
2. Initiator of the activity has to conform the protective zones of the water source to the Rezekne Environmental Health Centre and to receive the assessment of the hygienic project solution.
3. If the water level and drinking water quality decreases in the water supply sources (wells, artesian wells, see Final report chapters 4.4, table 4.5, 4.6), that are installed in the zone (660 ha) influenced by the new water source, the Rezekne municipality non-profit water and sewage company "Ūdenskanāls" shall perform their dredging (or instalment of new water supply sources) at their own expense.
4. Taking into account recommendations from the Final Environmental Impact Assessment Report and the ground water deposit Passport the monitoring programme for the ground water shall be developed and implemented and conformed with the Rezekne Regional Environmental Board. Monitoring shall be started before beginning of the water extraction.
5. During instalment of water delivery mains bogging-up shall be prevented.
6. Outlet of wastewaters from rinsing of water mains into the Rezekne River shall comply with the Cabinet of Ministers Regulations No 155 from the 22nd April 1997 "On the water use permits".
7. Polluted technological wastewaters shall be discharged to the municipal sewage system and then further to the municipal wastewater treatment plant.
8. During development of engineering design it is necessary to develop an action plan for further management of existing wells or their liquidation.
9. After acceptance of the activity by the local government of the Griskani parish in the Rezekne region, the initiator of the activity according to the procedure determined by legislation shall request and receive the environment protection technical regulations in the Rezekne Regional Environmental Board.

Director J. Avotiņš

28 November 2001

ANNEX I(c) DECLARATION - PROJECT NOT IN ESA

ANNEX I (c)

DECLARATION OF COMPETENT AUTHORITIES WITH RESPECT TO ENVIRONMENTALLY SENSITIVE AREAS (ESA's)

PROJECT IS NOT LOCATED WITHIN AN ESA

The Responsible Authority

Rēzekne Regional Environmental Board

Having examined the project application

Development of Water Services in Municipality of Rēzekne

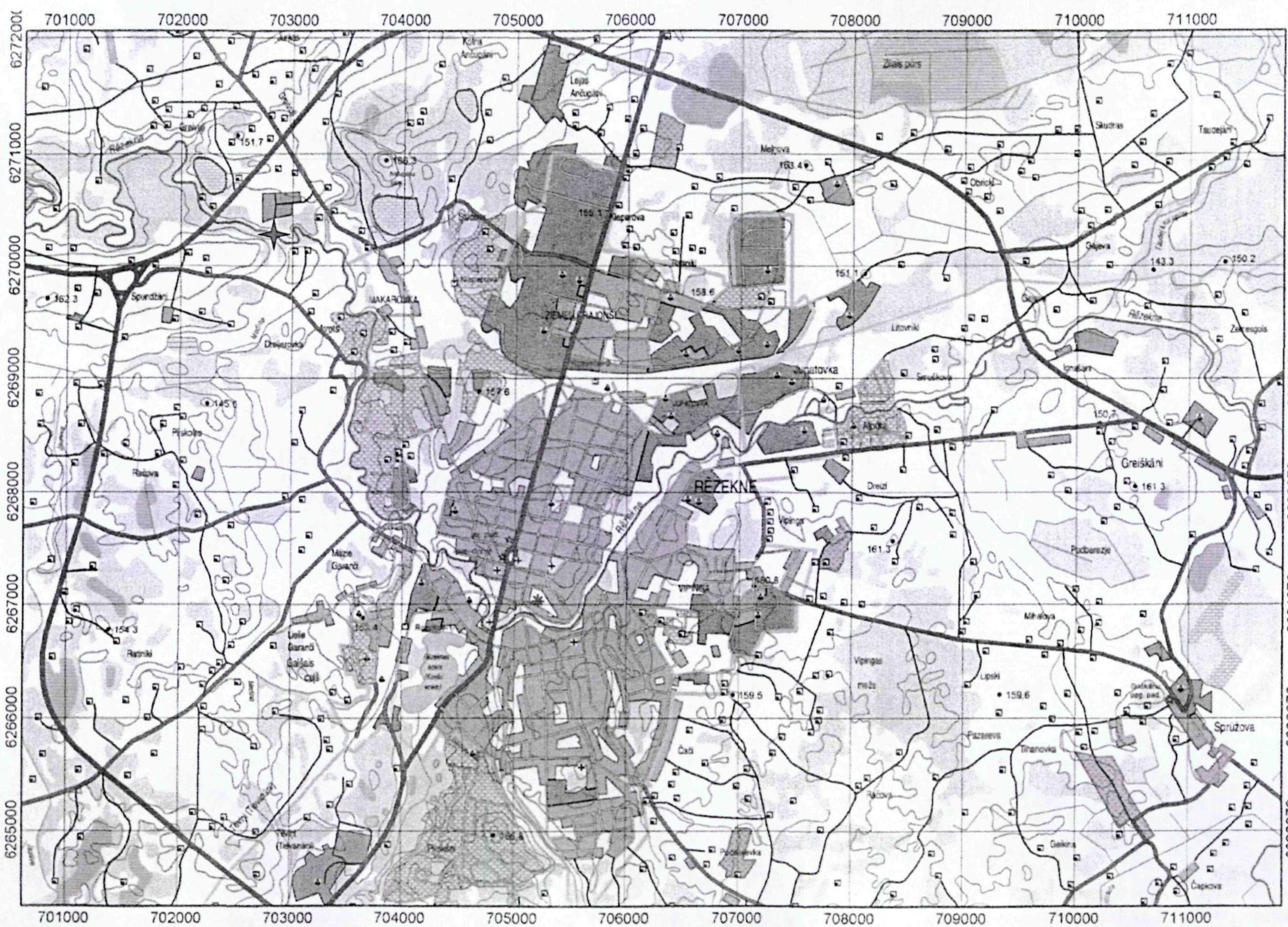
which is to be located at

Rēzekne City

Declares that it is neither within nor adjacent to an environmentally sensitive area as defined in Annex II of this application and will not have a significant effect on the environment. A scale map at 1 : 50 000 is attached.

Signed: E. Kuzmiņa

Official Seal:



RĒZEKNE

Scale 1 : 50 000

✦ - *Discharge place*