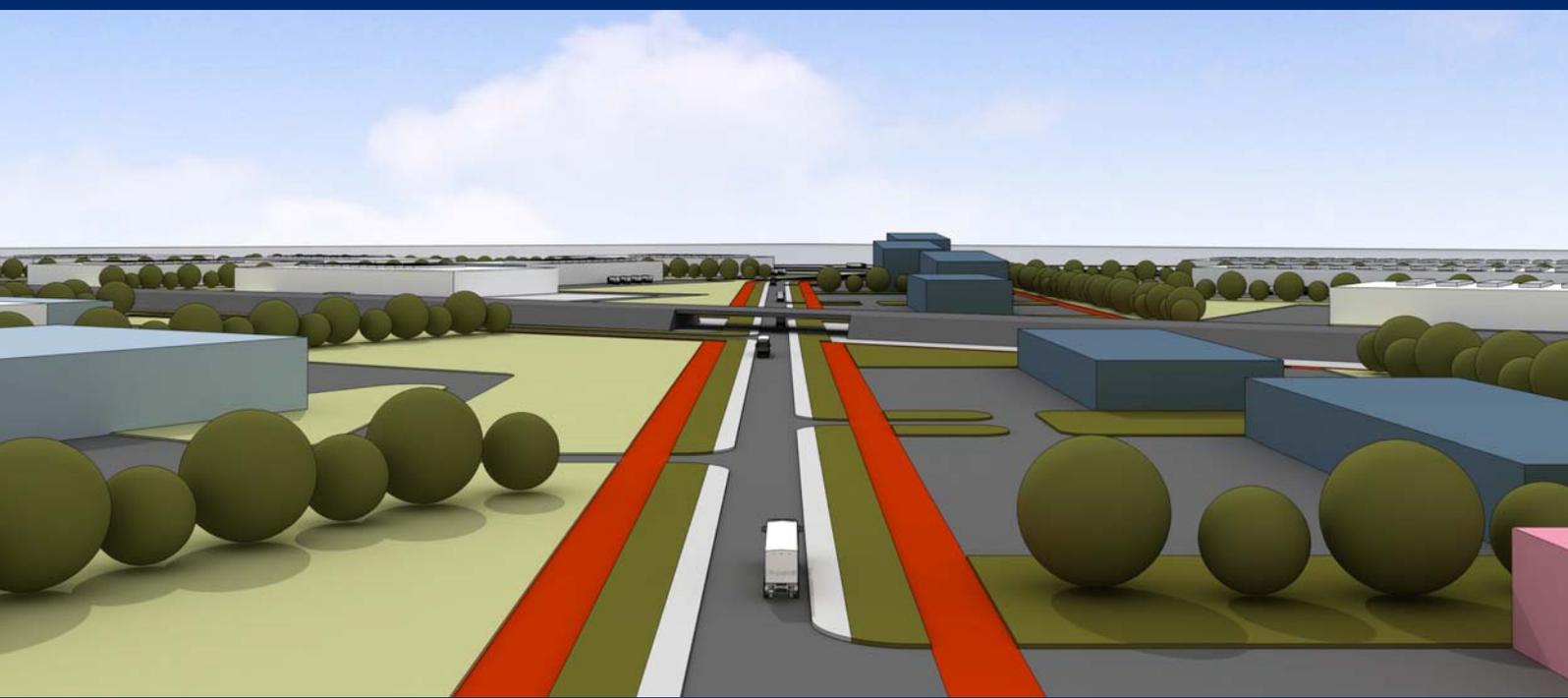




**USAID**  
FROM THE AMERICAN PEOPLE

LOCAL INVESTMENT AND  
NATIONAL COMPETITIVENESS



# INDUSTRIAL PARK LYSYCHANSK: CONCEPTUAL DESIGN REPORT

This publication is made possible by the support of the American People through the United States Agency for International Development (USAID) under the terms of Local Investment and National Competitiveness Project.

USAID|LINC is implemented by a consortium led by Chemonics International. Consortium members include The Berman Group, Economic Integration Forum, ILS – Ukraine, Ltd..

The contents of this publication are the sole responsibility of authors and do not necessarily reflect the views of USAID or the United States Government.



U.S. Agency for International Development  
Regional Mission to Ukraine, Moldova, Belarus

19 Nyzhniy Val Street  
Kyiv 04071, Ukraine  
Tel.: +38 (044) 537-4600  
Fax: +38 (044) 537-4684  
<http://ukraine.usaid.gov>



USAID Local Investment & National  
Competitiveness Project

14-A Ihorivska Street, 2nd Floor  
Kyiv 04655, Ukraine  
Tel.: +38 (044) 425-4747  
Fax: +38 (044) 425-7333  
[www.linc.com.ua](http://www.linc.com.ua)

**INDUSTRIAL PARK  
LYSYCHANSK:  
CONCEPTUAL DESIGN REPORT**

# CONTENTS

Conceptual Design Report .....	5
1. Development motto and vision .....	6
1.1. Global trends and assumptions .....	6
1.2. Local development specifics and pre-conditions .....	6
1.3. Development vision .....	7
2. Development phases.....	8
3. Spatial development framework.....	9
4. Infrastructure development needs, requirements and assumptions .....	12
4.1. Gas .....	12
4.2. Electric energy .....	13
4.3. Water .....	13
4.4. Sewage water .....	14
4.5. Surface water .....	14
4.6. Standard cross-section .....	15
5. Bill of development quantities.....	15
6. Development costs .....	16
7. Feasibility report, risk analysis and follow up actions identification.....	17

## LIST OF ATTACHMENTS:

1. Spatial analysis of Czech cities and industrial sites

## LIST OF DRAWINGS:

1. Wider relations 1:5 00 000
2. Site analysis 1:5000
3. Site plan 1:5000
4. Perspective view (camera 01)
5. Perspective view (camera 02)

# Conceptual Design Report

**Lysychansk, Ukraine**

## **List of authors**

Project Manager:	Radim Gill
Architect:	Karel Barinka
Transport engineer:	Martin Krejci
CAD support:	David Halir
Data analyst:	Jirina Hrudova
Urban planner:	Bart Muskens
Translator:	Roman Proskurenko

Kyiv, Ukraine

Prague/Brno, Czech Republic

Radim Gill

*Project Manager*

# 1. Development motto and vision

## 1.1. Global trends and assumptions

From a long-term perspective, the expected continuing growth of the Ukrainian national economy will generate a higher demand for more advanced business locations. It will also lead to the development of a more sophisticated production infrastructure that will benefit both domestic Ukrainian producers and international investors (FDI). It is estimated that this domestic demand for advanced business accommodation will be larger in industrialized agglomerations and important transport nodes, where both indigenous and international businesses are already established. This is certainly the case for Lysychansk, a city with a long industrial history.

The proposed development plan, of which this conceptual design report is one step, also aims to attract FDI-companies to the city. It is assumed that FDI-companies (especially investments in production facilities) will continue to move some of their operations from Western or Central Europe to the East. This is due to their mobility and the permanent need to seek the most cost-effective conditions to compete at global markets. It is assumed that this move will take place within the next 10-15 years and that Ukraine has the potential of playing a significant role as one of the “hot spots” in Eastern Europe. Parts of the country will be able to accommodate the spatial requirements for the expected FDI influx. It is obvious that the best prepared sites will have the focus of foreign investors first.

Experience from the development of Central Europe shows that, for the location of foreign direct investments, the number of inhabitants of the city itself is relatively unimportant. Of larger significance are the infrastructural / logistical relations, the structure and strength of the regional economy, and the size of the site in relation to the economical strength of the city. This relation has been analyzed in the framework of this project and the outputs of the analysis are included in attachment No.1.

## 1.2. Local development specifics and pre-conditions

The city of Lysychansk is a city of regional importance in Luhansk region, in Eastern Ukraine. It is located approx. 720 kilometers east of Kyjiv and approx. 1500 kilometers south of Moscow. Lysychansk has a continental climate with dry, hot summers and cold winters. The city has a population of 123.800 residents and is 9,600 ha in size, thus being a medium sized city. Within a 30 kilometer radius there is a



population of about 300.000, also including the neighboring city of Severodonetsk. Both are part of the Donets Basin, which is a heavily industrialized region in eastern Ukraine, with a history in coal mining. Within the catchment area of the proposed industrial park there is a sufficiently large labor force available.

From a local perspective, THK-BP is a major oil refinery in Lysychansk. Producing motor gasoline, diesel, fuel oil, polypropylene and bitumen, it's one of the biggest companies of the Ukraine.

The government of Lysychansk has an active role in supporting the development of a new industrial park and stimulating local economic development. During the process of strategic planning, the city identified a number of reasons why companies should invest in Lysychansk:

- the city has a strong industrial history and tradition;
- the city is actively promoting industrial development;
- infrastructural connections by both railway and highway are available;
- flexible industrial sites are available;
- skilled and competent labor force;
- presence of 6 secondary schools, 2 technical high schools and 2 university faculties, sport clubs, a hospital and social / cultural facilities;

- Lysychansk is home to THK – BP, the largest oil refinery in Ukraine;
- facilitation of the discussion between local businessmen and the regional government.

South of Lysychansk, a site of land has been identified that is suitable for the establishment of an industrial park of local / regional importance. The proposed industrial park could be combined with a commercial development (the so called shared services center in the southern part). The overall size of the available land is too large to develop all at once, therefore a phasing is proposed.

A conceptual plan is prepared on the land, which is in the ownership of the city (phase I – III). A typical industrial park of regional importance in Central Europe has the following spatial parameters:

- a site with 40 – 80 ha of flat land, without any physical barriers or historical pollution;
- easy access to the site from the city (not to go through the city itself)
- at least 150.000 inhabitants in the catchment area (up to 40-45min. accessibility by car/bus);
- no legal-ownership obstacles;
- the site offers flexibility, allowing a division into sub-sites/plots (1-10ha) for different owners;
- the plots accommodate industrial productive halls of various sizes (from 2.000 – 10.000 sq.m), or flexible spatial combinations of these;
- railway siding is recommended if the regional industrial structure supports that
- all business premises in the industrial park are free standing buildings / halls;
- a concrete plot offered to an investor has to accommodate future extensions of the investor's production facility. This means that the initial development plan shouldn't be too intensive and some flexibility adjustment should be kept when calculating energy demand;
- a step-by-step development ensuring the flexibility and opportunities to adapt to changing demands;
- a maximum distance of ten kilometers to the highway/motorway of national (or at least regional) road network;
- the possibility of having special services on site (a multifunctional centre with some potentially shared services as a minimum: copying, legal services, catering, retail);
- the availability of infrastructure for an adequate accessibility of both the entire site and the individual building plots;
- a decentralized Park Management Unit (PMU) is recommended but not necessary; this can also be provided for by a city official from a centralized basis (e.g. city hall).

Concluding, with the exception of transport (road) connection and site accessibility the site in Lysychansk has almost all of the above features that are essential for a successful regional industrial park.

### 1.3. Development vision

The development vision is to create an industrial park that will play a significant role in accommodating the needs of mainly indigenous and possibly FDI-companies to Lysychansk. This includes the development of a flexible and attractive local / regional industrial park with the working title **Industrial Park Lysychansk** (abbreviation IPL) with a total size of 53 ha. The IPL should attract companies seeking good conditions for the establishment of their production base, including a stable and committed local government.

At this moment it is unknown what companies will locate in Lysychansk. Therefore the development concept needs to be flexible, meanwhile taking into account the general types of industries that can be expected on this location. Due to the local specifics (rather limited resources of water) it seems to be realistic to develop industries and business services that demand relatively little water. Also, it takes into account the industrial tradition of the city. This translates to a spatial concept that can be described as follows:

- The start of the development will be in the western part of the site, which is closest to the existing infrastructural connections. It is proposed to assign and promote **phase I** for the development of medium-sized mixed productive investments in manufacturing industries, storage facilities, assembly operations and relatively heavy industries like the next processing of metal.
- **Phase II** of the industrial park will be developed in the central part of the site. This phase can be promoted to attract investors for the development of medium to large sized investments in manufacturing industries, logistics, assembly operations and relatively heavy industries.
- To assign **phase III** to attract investors for the development of medium and large sized investments in manufacturing industries, assembly operation and relatively heavy industries. Also, there are opportunities for logistics here, since this part of the site will be adjacent to a future railway connection that links to the Ukrainian rail-network. Storage and logistics, for example for dry building materials or containers, could be attracted here.

- To keep the sites of **phase IV** and **phase V** as development reserves, for which there is no detailed concept proposed at present. The concept should be developed taking into account the types of businesses attracted in the earlier phases, when there is a better insight in the expected demand. This could be a combination of business and commercial functions. It should be taken into account that phase IV has a number of building limitations and protective zones because of the existing power lines on this part of the site.

A fully occupied industrial park will usually generate demand for the following services and functions: office accommodation, retail, catering, legal services, accounting services, reprography, and other commercial services that are not being developed with the industrial premises. Therefore, if there is a demand for these services, parts of **phase IV** or **phase V** could be developed for this type of businesses.

## 2. Development phases

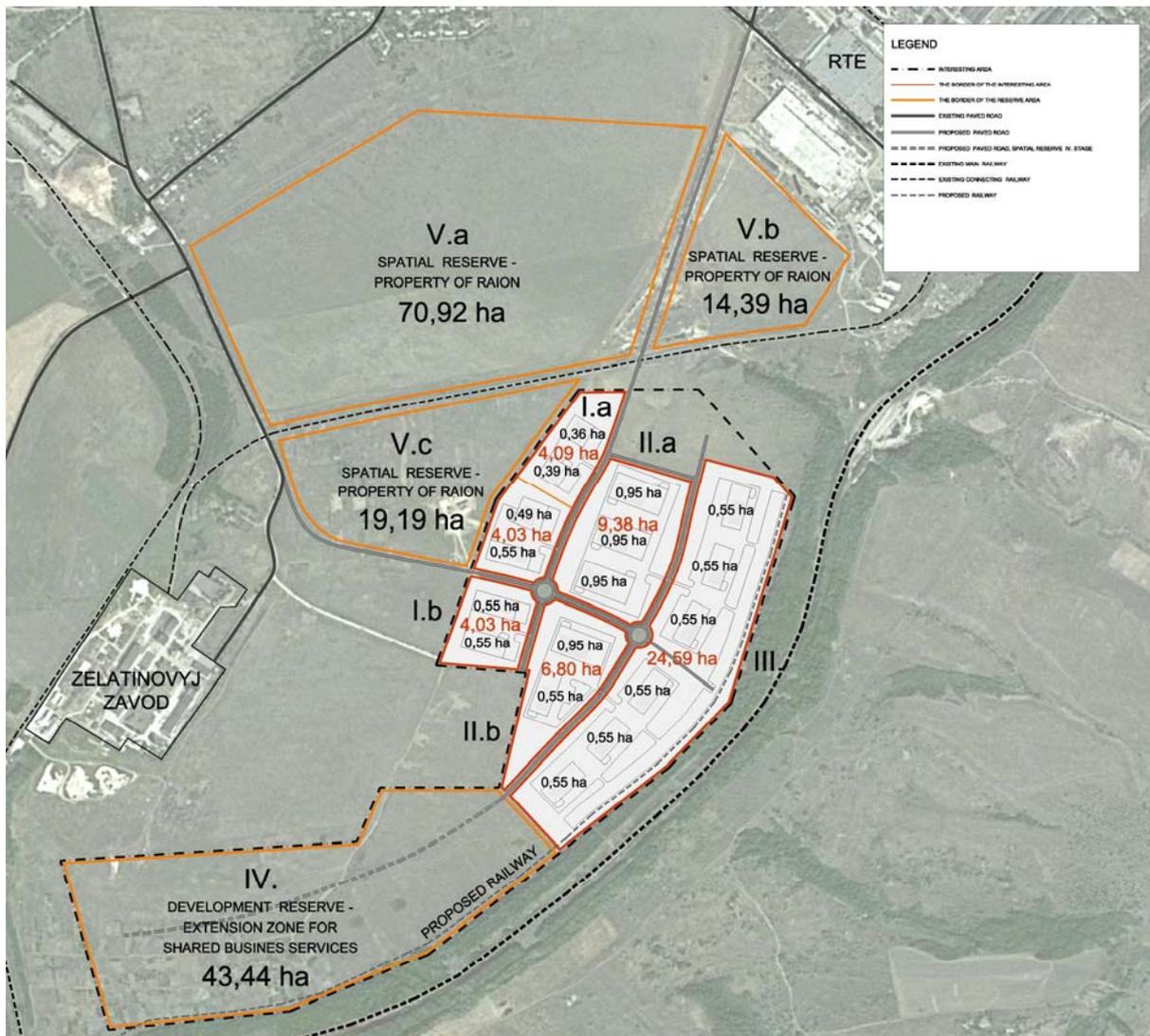
A site with a total area of about 53 ha has been divided in phases to accommodate step-by-step development. At this stage, (with data currently available) we assume that the development will start at the west of the site (phase I), continuing to the east in phase II and later phase III. In doing this, a gradual construction of infrastructure towards the eastern part of the site will be possible.

There are also reservations for possible extensions, further to the south (43,44 ha) and the north<sup>1</sup> (104,5 ha) that can be developed later. The planning of phase IV and V demand further additions to the current infrastructure and an extension of the current infrastructure.

Phase	Area (ha)	Proposed general function	Not recommended
Phase Ia Phase Ib	12,15 ha	medium-sized mixed productive investments in manufacturing industries, storage facilities, assembly operations and relatively heavy industries like the next processing of metal.	Industries relying on an intensive use of water resources
Phase IIa Phase IIb	16,18 ha	medium to large sized investments in manufacturing industries, assembly operations and relatively heavy industries	Industries relying on an intensive use of water resources
Phase III	24,59 ha	logistics and storage, also manufacturing industries, assembly operations, heavy industries	Industries relying on an intensive use of water resources
Phase IV	43,44 ha	to be decided later, depending on businesses in phases I - III	Industries relying on an intensive use of water resources
Phase Va	70,92 ha	to be decided later, depending on businesses in phases I - IV	Industries relying on an intensive use of water resources
Phase Vb	14,39 ha	to be decided later, depending on businesses in phases I - IV	Industries relying on an intensive use of water resources
Phase Vc	19,19 ha	to be decided later, depending on businesses in phases I - IV	Industries relying on an intensive use of water resources
<b>Total net area</b>	<b>52,92 ha excl. reservation</b> <b>96.36 ha incl. reservation with phase IV</b> <b>200,86 ha incl. reservation with phases IV+V</b>		

The proposed layout of each part, as well as its position in the overall framework of the site, is shown in the following scheme. This scheme takes into account the distances that have to be kept to technical infrastructures. There is an uncertainty about the location and/or functionality of the identified underground facilities. It is strongly recommended to make a detailed measurement and mapping of all underground infrastructures before the real start of the development process.

<sup>1</sup> Discussion with the owner of the northern parts (Va, Vb, Vc) to share the initial investment is essential.



© DHV CR, 02/2011

### 3. Spatial development framework

The development framework of the site aims to provide a flexible spatial layout, while making optimal use of the available land. When developing and zoning the site, a number of protection areas have to be taken into account. The above shown design has thus taken into account the following parameters:

- accessibility from the northwest / north still has to be improved
- there is no accessibility from the east and south at present
- existing railway directly next to the site
- a middle pressure gas pipeline at > 1000 meters from the site
- existing electricity (transformer station) at > 1000 meters from the site
- water supply is at 600-900 meters away from the site, depending on the connection point
- sewage system at 800-1200 meters from the site but above the average altitude of the site
- a spatial plan that can be developed flexible in time
- air high-voltage cables in phase IV and the southern part of phase III
- existing ethylene-line and its protected area on the south
- flat site sloped to north-east
- at a relatively large distance from residential zones, the closest housing area is to the northeast (> 1000 meters from phase I), thus decreasing the risks of noise nuisance problems
- existing WWTP with no capacity reserve

A key factor of success for the IPL is the attraction of a so called 'anchor investor' to either phase I or phase II. This 'anchor investor' is a strong enterprise with a sound brand, being either an indigenous or a foreign company. Usually other investors will then be attracted to the site as well. The profile of the 'anchor investor' often determines the profile of the park as a whole. Thus, it will function as a promotion for the future development of the entire park.

#### Phase I: description of the spatial development framework

Phase I has an expected functional mix of medium-sized manufacturing industries, storage facilities, assembly operations and relatively heavy industries like the next processing of metal. Given the structure of the municipal economy, it is expected that relatively large companies will locate in this area. Therefore, relatively large plots are proposed that will be adequate for the expected functions and provide the necessary flexibility. A division in three plots with sizes of about 4 ha. is proposed in the site plan drawing. It is expected that there will be single storey buildings, with a spatial reserve included in each plot to allow for future extensions. Possibly there will also be a demand for smaller plots. If this demand indeed exists, the site drawing of phase I allows for flexibility by subdividing the larger plots in a number of smaller plots.

#### Phase II: description of the spatial development framework

Phase II has an expected functional mix of medium to large sized businesses in manufacturing industries, assembly operations and relatively heavy industries. In this phase, relatively large companies are expected as well. Therefore, it is proposed to structure the site of phase II in two plots with a size of 6,80 and 9,38ha, as shown in the drawing site plan. These plots shall accommodate industrial premises (halls) with a gross floor area up to 9.500 sq.m. A bandwidth in available hall-sizes can be provided for by including halls of lesser gross floor area (flexibility). Again, there is some space reserved on each plot to allow for future extensions of the individual facilities.

All industrial buildings within phase II are assumed to be single storey buildings. It is assumed that the plots of phase II will be developed after the completion of phase I. This allows for the reinvestment of the revenues from phase I, thus decreasing the need to rely on external funding sources.

#### Phase III: description of the spatial development framework

Phase III is close to a future extension of the railway network. This will allow for the location of logistical and storage companies on this part of the site. The expected functional mix is to be decided later, including a mix of logistics and storage, and possibly also manufacturing industries, assembly operations and heavy industries. Again, relatively large companies and production / logistical facilities are expected. Therefore, the site has been divided in a number of building halls within the total area of 24,59 ha. It is expected that the plots in phase III will accommodate industrial premises (halls) with a gross floor area of 5.500 sq.m. Again, there is a bandwidth of available plot- and hall-sizes that can be provided for. Each plot allows for a spatial reserve that allows for future extensions of the individual facilities.

All industrial buildings within phase III are assumed to be single storey buildings. It is assumed that this phase will be developed after phases I and II. When there is a clear demand from investors needing rail transport for their business, then an investment decision needs to be made to extend the railway line. Part of this could be financed by the reinvestment of revenues from phases I and II.

#### Phases IV and V: spatial development reserve

Two sizeable spatial development reserves are identified on the southwestern and northern part of the site. These are marked in the draft plan as phase IV, with a size of 43,44 ha and V, with a total size of 104,5 ha. For both phases, the development depends fully on the success of the phases I-III and the type

of companies / investors that will locate here. For this reason, a detailed spatial plan has not been made yet. Nevertheless, it is expected that the zoning of phases IV and V will be very similar to the zoning proposed for phases I and II. In phase IV, there could be a demand for a shared business centre or joint facilities. Finally, when making the design draft for phase IV, the power lines and ethylene line underground on site have to be taken into account. To develop successfully plots of phase V an agreement with the owner is required.

### Spatial analysis of sites in Czech cities

A thorough spatial analysis of more than 40 industrial sites in Czech Republic has been made in the framework of this study. To have comparable outputs, this study focused at sites in cities smaller or equal to 25.000 inhabitants. The results of this analysis are shown in attachment No. 1 to this report, including unique mapping material. Our consultancy found the following conclusions as a result of this analysis, which can be used as an argument for the development of IPL:

- there is a direct relation between the economical strength of a city and its opportunities to properly develop and maintain an industrial park. Although some exceptions exist, larger cities are stronger economically, and will therefore be able to develop larger parks.
- for the category of cities with 20.000 – 25.000 inhabitants<sup>2</sup>, in Central Europe a typical industrial park has a size of between 12,0 and 25,0 ha., which represents approximately 2%-9% of the total city area<sup>3</sup>;
- the cities of the same size as Lysychansk with sufficient labor force buffer in the outskirts were able to develop industrial parks even with the size of 80 – 100 ha;
- however the map inputs are not showing the current situation, it is known to the consultant that some of the Czech sites developed at the beginning of the 21<sup>st</sup> century are not yet fully occupied in 2010.

### Conclusion

The site is adequate for the development of an industrial park for the city of Lysychansk. Reasons for this are the industrial history of the region, the current economic strength of the city, the flexibility of the plots in the draft plan and the available regional labor force. Given the distance to the city and some infrastructure connection points, it should be noted that significant investments in infrastructure will have to be made to open up the site for business development. Since neighboring lands are owned by the region, it is recommended that negotiations take place with them to share investments in infrastructure.

The investment of the railroad extension in phase III should only be made when there is a validated demand from businesses to invest in logistical operations on this part of the site.

The development of phases IV and V is conditionally and will take place only after phases I – III are fully completed. When drafting plans for phase IV, the protection zones below the existing power lines have to be taken into account.

---

<sup>2</sup> As a typical comparable representants consultant considers examples of the cities of Vyskov, Blansko, Havlickuv Brod, Zdarn. Sazavou, Krnov, Louny – for details pls refer to attachment No.1. Of course there is also exceptional example of the city of Koprivnice with industrial site with more than 80 ha or village Nosovice where Hyundai developed its own factory at the site with more 100 ha. These exceptional examples had not been taken into account.

<sup>3</sup> Compare:

phase I-III=52,92 ha

phase IV-V=147,94 ha

Lysychansk territory=9.600 ha

ratio=(52,92/9.600) \* 100 = 0,55%

ratio=(147,94/9.600) \* 100 = 1,54%

## 4. Infrastructure development needs, requirements and assumptions

The energy demand and consumption has been calculated for following development stages and parameters:

Phase	Size (ha)	GFA/site size (%)	Gross floor area of production and business facilities and storage halls (sq.m.)	Estimation of people employed <sup>4</sup> (person) <sup>5</sup>
Phase I	12,15	24%	28.900	240 – 250
Phase II	16,18	26%	43.500	320 – 330
Phase III	24,59	13%	33.000	360 – 370
<b>Total</b>	<b>52.92</b>		<b>105.400</b>	<b>920 – 950</b>

Other technical assumptions for all phases 1-3:

- All sites are considered “dry sites” as for the consumption of water. Production industries that are mainly “water-based” are not recommended due to a lack of water sources (for example paper/pulp production, iron/steel production, chemical industries, similar types of industry heavily relying on the use of potable and industrial water);
- The production facilities at the site can have an increased (higher than average) demand for gas and electricity given the supplies available at the site. This means middle sized machinery is possible, but production facilities with extremely high demands for gas / electricity are impossible;
- All municipal sewage water of the developed IPL will be properly treated in a WWTP. If one of the production facilities will emit industrially polluted water, a special industrial WWTP will have to be located at the IPL or at the investor’s own site.

### 4.1. Gas

Demand for gas						
Formula	Q <sub>max</sub> = size (ha) x average relative consumption in m <sup>3</sup> /hour					
	ha	avg estimated consumption m <sup>3</sup> /hour, ha	number of working hours	number of working days	flexibility adjustment factor	approx. estimated total demand for gas m <sup>3</sup> /year <sup>6</sup>
Phase I	12,15	100	8	260	1,1	2.780.000
Phase II	16,18	100	8	260	1,1	3.702.000
Phase III	24,59	60	8	260	1,1	3.376.000
<b>Total</b>	<b>52.92</b>					<b>9.858.000</b>

### Conclusion

The demand for gas at the IPL is expected to be about 9.9 million m<sup>3</sup> / year for the phases I – III. This equals to approximately 4700 m<sup>3</sup> / hour. Due diligence has shown that, according to city officials and utility providers, a gas quantity of 2500 – 3100 m<sup>3</sup> / hour can be delivered to the site. This means that it is probable that enough gas will be available for the development of phases I – II. When the development of phase III starts, it is expected that an upgrade of the existing gas supply network is needed.

<sup>4</sup> rounded-off

<sup>5</sup> assumptions based on experience from Central Europe

- logistic, warehousing and less labor intensive productions: 15 person employed/ha
- assembly, electronic, light machinery, processing: 20 persons employed/ha

<sup>6</sup> rounded-off

To connect to the city gas network, investment in a gas reduction station is needed. A potential location for this gas reduction station is > 1000 meter north of the site, near the entrance of rubber factory RTE.

#### 4.2. Electric energy

Demand for electric energy						
Formula	Qmax= size (ha) x average relative consumption in KW/ha					
	ha	avg consumption KW/ha	number of working hours	number of working days	flexibility adjustment	total demand for electricity MW <sup>7</sup>
Phase I	12,15	180			1,1	2,41
Phase II	16,18	180			1,1	3,20
Phase III	24,59	100			1.1	2,70
<b>Total</b>	<b>52.92</b>					<b>8,31</b>

#### Conclusion

The demand for electricity at the IPL is expected to be about 8,31 MW for the phases I – III. Due diligence has shown that, according to city officials and utility providers, an electrical power of 5 – 10 MW can be provided without a substantial upgrade of the electric transformer station. This means that it is probable that enough electrical power will be available for the development of phases I and II, partly depending on the presence of relatively heavy industries with a higher demand for electricity. When the development of phase III starts, it is expected that the existing transformer station will have to be reconstructed.

A potential electrical connection point is the existing transformer station > 1000 meter north of the site, near the entrance of rubber factory RTE. A new connection will have to be made between this point and the proposed site of phases I – III.

#### 4.3. Water

Demand for water (not industrial)						
Formula	Qmax= size (ha) x average relative consumption in l/s, ha					
	ha	avg consumption l/s, ha	number of working hours	number of working days	Flexibility adjustment	total demand for water l/s <sup>8</sup>
Phase I	12,15	0,8			1,1	10,69
Phase II	16,18	0,8			1,1	14,24
Phase III	24,59	0,8			1,1	21,64
<b>Total</b>	<b>52.92</b>					<b>46,57</b>

#### Conclusion

The demand for water at the IPL is expected to be about 46,57 l/s for the phases I – III. This equals to approximately 168 m<sup>3</sup>/hour. Due diligence has shown that, according to city officials and utility providers, a water supply of 50 m<sup>3</sup> / hour can be delivered. This means that sufficient water will be available for phase I, but insufficient water will be available for phases II and III. New sources of water have to be identified with a capacity of about 50 m<sup>3</sup>/hour for phase II and 80 m<sup>3</sup>/hour for phase III.

A potential water connection point is west of the site. A new connection will have to be made between this point and the proposed site of phases I – III.

<sup>7</sup> rounded-off

<sup>8</sup> rounded-off

Depending on the distance from an existing fire station to the proposed site, a reserve for fire water may be needed. When a fire station is within 2 km. distance, no provisions have to be made. When the fire station is further away, a reserve for fire water of 6,0 l/s has to be made. A final technical solution for delivering fire water to the site still will have to be decided.

#### 4.4. Sewage water

Sewage water calculation						
Formula	Q <sub>max</sub> = size (ha) x average relative usage in l/s, ha					
	ha	avg usage l/s, ha	number of working hours	number of working days	Flexibility adjustment	total demand for water l/s <sup>9</sup>
Phase I	12,15	0,8			1,1	10,69
Phase II	16,18	0,8			1,1	14,24
Phase III	24,59	0,8			1,1	21,64
<b>Total</b>	<b>52,92</b>					<b>46,57</b>

#### Conclusion

The assumption behind the sewage water calculation is that all water that is being brought into the site will be used, and should thereafter be treated properly by a sewage system and a waste water treatment plant (WWTP). The expected amount of waste water from IPL is 46,57 l/s for the phases I-III. This equals to approximately 1340 m<sup>3</sup> / day of waste water with an 8 hour shift.

Due diligence has shown that, according to city officials and utility providers, a sewage line is available 800-1200 meter northwest of the site, connection to a WWTP. Yet, to connect here, a pumped sewage-network would have to be developed and the existing WWTP would have to be upgraded. Therefore it is proposed to develop a new gravitation sewage system and a WWTP in the lowest part of IPL. This treatment plant should have sufficient capacity for phases I and III, with a possible extension when phase IV and V will be developed.

It is assumed that no industrially polluted water is included in the total amount calculated. This water has to be treated properly by companies themselves.

#### 4.5. Surface water

*Calculation of surface water for phases I-III*

*Calculation of surface water for phases I-III*

$$Q_{\max} = \text{size}^{10} \text{ phase I-II-III (ha)} \times 0,6 \times 60 \text{ l/s} = 52,92 \times 0,6 \times 60 = 1905 \text{ l/s}$$

$$Q_{\text{total site}} = \text{size total (I-II-III-IV-V)} \times 0,6 \times 60 \text{ l/s} = 200,86 \times 0,6 \times 60 = 7231 \text{ l/s}$$

#### Conclusion

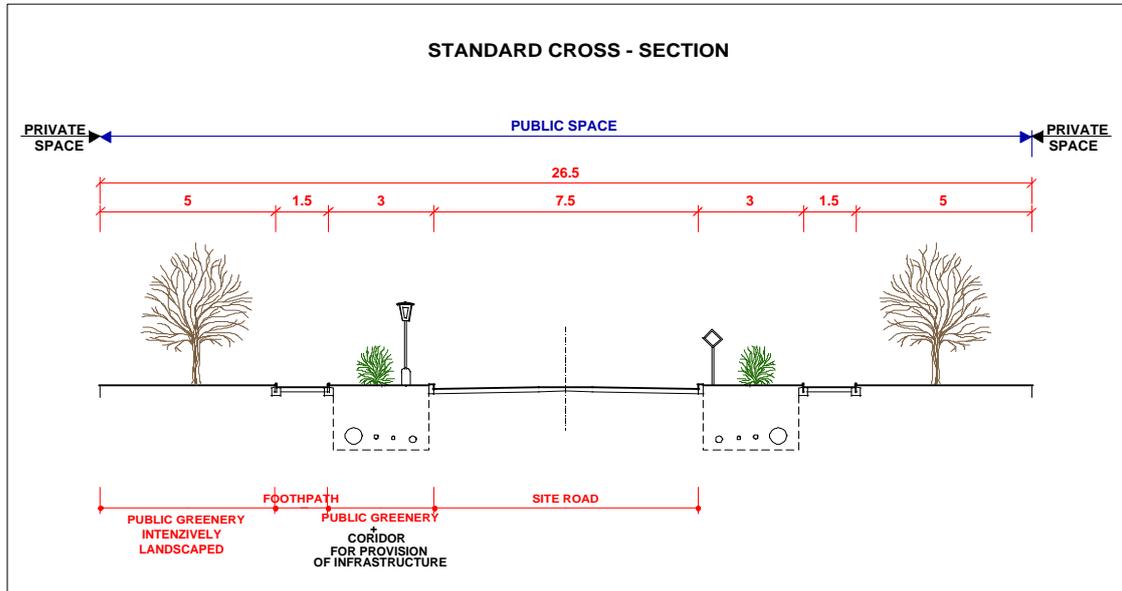
The paved and built up areas within the IPL will be large, meaning that the needed discharge of surface water after heavy rainfall will also be sizeable. This water should be treated properly. A partial retention (up to 5.000 m<sup>3</sup>) of the surface water can be created on the northern part of the site in the form of a retention lake. This retention facility is on the lowest point of the site, and will be designed in such a way that it is able to collect rain-fall water from sites I-III created by 50-60 min of heavy rainfall. Secondly, a part of the surface water must be treated by the private companies at their own sites (about 20 %).

<sup>9</sup> rounded-off

<sup>10</sup> Size of the paved parking places + paved roads + paved footpaths + total size of the roofs of the production facilities and other buildings, approx 60% of the size of site is considered as a built-up area

Remaining surface water has to be discharged to the closest surface sewage. It is expected that after retention the volume of surface water from the fully developed IPL (phase I-III) can still represent some 225 l/s and will be taken from the site with gravitation pipes (Dn 600-800mm) to the new WWTP.

#### 4.6. Standard cross-section



#### Conclusion:

A spatial configuration of a cross section is proposed to be able to maintain the public space of the industrial park in the future. Good maintenance is needed to preserve the quality of the park and thus keep it attractive for future investors. The layout (e.g. width) of the road and the footpath can be adjusted to local road standards, safety regulations or other local rules. If the road crosses through the IPL, a footpath is recommended on both sides of the road. If it's at the edge of the park, a single-sided footpath is sufficient. The so called "public space" usually remains in public ownership and is maintained by the city itself (highlighted in blue on the picture above).

### 5. Bill of development quantities

The table below roughly and provisionally shows the public investments that will be needed to realize phases I-III of IPL, based on the calculation of the development quantities. The breakdown of quantities into the phases is done according to expected approx. ratio 23:31:46, taking into account the sizes of the different phases. The assumption is made that the public sector will be responsible only for back-bone infrastructure and public spaces development; the investments in building plots will be the matter of private investment.

The breakdown of quantities is an estimation that will turn out to be different in reality. Yet, it is sufficient for the conceptual thinking in the current stage of development; it provides the city with a clear picture of the investments that are needed for the initial development. The calculation also shows how the initial costs could be divided among the investors or tenants of different phases. Final remark: additional investment actions realised outside of the development site of IPL are not included in the bill of quantities<sup>11</sup>.

<sup>11</sup> E.g. mainly: road crossing, roundabouts, bridges, new WWTP, necessary upgrade of the existing transformer station, necessary upgrade of the existing gas reduction station, necessary upgrade of the existing water sources and other similar additional investment projects caused by development out of site territory. To assess and to quantify this investment a more detailed study is needed.

Bill of quantities						
Item No.:	Item	Unit	phase I	phase II	phase III	total
			12,15 ha	16,18 ha	24,59 ha	52,92 ha
			23 %	31 %	46 %	100%
1.	Purchase of the land	ha	0	0	0	0
2.	Public paved site roads w. 7,6 m incl. road signs	sq.m	5926	7987	11851	25.764
3.	Public parking places incl. road signs	sq.m	not applicable			0
4.	Public footpaths w. 1,5m incl. orientation system	sq.m	828	1116	1656	3.600
5.	Public green strips w. 3,0m incl. landscaping	sq.m	3864	5208	7728	16.800
6.	Public green barriers	sq.m.	one location			
7.	Backbone infrastructure - gas network incl. sub-connection points, Dn 150-200 mm	m	690	930	1380	3.000
8.	Backbone infrastructure - water network inc. sub-connection points, Dn 300mm	m	518	698	1035	2.250
9.	Backbone infrastructure - electric network incl. sub-transformer station	m	690	930	1380	3.000
10.	Backbone infrastructure - sewage network incl. sub-connection points, Dn up to 600 mm	m	437	589	874	1.900
11.	Backbone infrastructure - surface water network/drainage incl. sub-connection points, Dn up to 800 mm	m	518	698	1035	2.250

The table below shows the bill of quantities regarding the land to be sold to investors and the land alongside the backbone infrastructure which should remain in public ownership.

Bill of quantities – land for sale v. land to remain in public ownership						
Item No.:	Item	Unit	phase I	phase II	phase III	total
			12,15 ha	16,18 ha	24,59 ha	52,92 ha
			23 %	31 %	46 %	100%
1.	Land for sale to investors	ha	12,15	16,18	24,59	52,92
2.	Land to remain in public ownership (roads within the site)	ha	0,42	0,56	0,84	1,82
3.	Land to remain in public ownership (footpaths)	ha	0,08	0,11	0,17	0,36
4.	Land to remain in public ownership (green road strips)	ha	0,39	0,52	0,77	1,68

## 6. Development costs

The table below shows the approximate initial investments that have to be done by the public sector to meet the standard requirements of the investors coming to the park<sup>12</sup>.

<sup>12</sup> The cost of a new artesian well and the retention lake are not yet taken into account

Bill of quantities - initial public investment					
Item No.:	Item	Unit	Units needed with all plots fully developed	unit price <sup>13</sup> (EUR)	total price (EUR)
1.	Purchase of the land	ha			0
2.	Public paved site roads incl. road signs	sq.m	25.764	60	1.545.840
3.	Public parking places incl. road signs	sq.m		0	
4.	Public footpaths incl. orientation system	sq.m	3.600	30	108.000
5.	Public green areas incl. landscaping	sq.m	16.800	15	252.000
6.	Public green barriers	sq.m.	0	0	0
7.	Backbone infrastructure - gas network incl. sub-connection points, Dn 150-200 mm	m	3.000	120	360.000
8.	Backbone infrastructure - water network inc. sub-connection points, Dn 300mm	m	2.250	210	472.500
9.	Backbone infrastructure - electric network incl. sub-transformer station[2]	m	3.000	150	450.000
10.	Backbone infrastructure - sewage network incl. sub-connection points, Dn up to 600 mm	m	1.900	250	475.000
11.	Backbone infrastructure - surface water network/drainage incl. sub-connection points, Dn up to 800 mm	m	2.250	250	562.500
	<b>total EUR</b>				<b>4.225.800</b>

It is estimated that approx. 70-80 % of the total cost should be spent to open the sites of phases I and II. This requires an investment of approx 3,0-3,5 mil. EUR, not taking into account additional investments that will be needed around the site and the cost of the retention lake, artesian well, new WWTP, gas reduction station and reconstruction of the electrical transformer station. This investment will produce a fully serviced site of more than 280.000 square meters that can be sold to investors.

## 7. Feasibility report, risk analysis and follow up actions identification

The aim of this chapter is to identify the potential risks of possible development and propose a combination of measures to minimise them. The risks are evaluated only from the point of view of the technical and environmental aspect. There are certainly other risk portfolios at business, political, institutional and organisational level, but these are not managed in this concept.

<sup>13</sup> Based on approx. Central European unit prices, level 2009-2010. To be recalculated according to local price level with inclusion of all additional investment specified in the text above.

No. :	Specification of risk	Level <sup>14</sup>	Proposed measures
1.	Large investments are needed to make the site accessible (roads) and supply technical infrastructures.	A	<ul style="list-style-type: none"> <li>- Evaluate if sufficient resources (including future land sales) will be available to pay for infrastructural investments.</li> <li>- Evaluate / measure the use of gas and electricity when phase I is finished to see if additional capacity remains and investments in improvement of the systems can be postponed.</li> <li>- Do major investments only when needed and investments by private companies are certain.</li> </ul>
2.	Insufficient information about the underground infrastructure on site.	B	Perform a technical study on on-site infrastructure before the start of the development.
3.	Air/Noise pollution in relation to the existing housing on the north-western part of the site.	C	If heavy industry plans to locate on the site, air and noise spread study can be required to avoid negative impact on the housing area. The prevailing direction of the wind should be taken into account.
4.	Pollution of surface water	B	Surface water should be treated in a waste water treatment plant before being discharged in a river. Industrially polluted water has to be cleaned by companies themselves, this should be regularly checked and enforced by city officials.
5.	Soil contamination	C	Any possibility of local soil contamination must be eliminated by organisational regulations and construction alterations in the industrial areas. Companies must adhere to the system for handling waste; this should be enforced by city officials.
6.	Potential risk of contamination of groundwater.	B	Foundations should correspond to hydrogeological conditions. All the functional areas of the industrial site must have paved surfaces. Substances harmful to water should be stored in special purpose areas only in the necessary amounts.
7.	Industrial accidents	B	Prepare accident measures plan for the park management and require accident planning from all investors entering the IPL.

---

<sup>14</sup>Level A: highest risk category (project as whole is jeopardized if proposed measure is not taking into account properly)

Level B: risk still important, but lower than level A

Level C: lowest risk