DELIVERABLE D.T3.1.3

INVESTMENT PREPARATION DOCUMENTATION

Version 1
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B. Acknowledgements and basic sources

Revitalization design of zinc spoil heap in Ruda Śląska nearby 1May street is the consequence of following documents:

- agreement between municipality of Ruda Śląska and Design Studio: Pracownia Architektoniczno-Urbanistyczna i Twórczości Artystycznej 'HORTUS', Katowice;

- maps, agreements and low regulations;

- materials provided by IETU Institute;

- analyses of the utility features of zinc spoil heap deposit material of the subject area, done by CB Project, Laski and GIG Institute, Katowice;

- Integrated design of redevelopment of key public spaces in functional area of Chorzów, Ruda Śląska and Świętochłowice, done by ARCA Biuro Projektów Urbanistyki i Architektury, Gliwice 2014;

- mineralogical-chemical characteristics of zinc spoil heap in Ruda Śląska nearby 1May street, done by prof. Iwona Jonczy, Silesian University of Technology, Gliwice;

- Local revitalization plan for city of Ruda Śląska, horizon 2030.

C. Leaders of design:

Associated Professor eng. arch. Krzysztof Rostański - landscape design

Eng. arch. Lechosław Rostański - architecture

Assistant Professor Adam Rostański - flora

Eng. Bożena Bronicka - construction

Eng. Marek Marzec - lighting design

Associated Professor eng. arch. Magdalena Żmudzińska-Nowak - historical issues

D. Design targets

According to elaboration of revitalization design of zinc spoil heap in Ruda Śląska were indicated vital targets as:

- remediation and phytostabilization of heavy metals contaminations in the area;

- biodiversity protection;

- social participation.

E. Actions preceding the construction design

There were provided following actions and studies:

- social participation lead by ARCA Studio - meeting with inhabitants of local community which gave range of expectations and propositions; prime conception plan for area developing was a result of meeting;

- mineralogical and chemical characteristics of the area done by prof. Iwona Jonczy from Silesian University of Technology, Gliwice;

- study of utility features of zinc spoil heap deposit done by CB Project and GIG Institute;

- plant cover studies lead by specialists from Department of Biology and Environmental Protection, Silesian University, Katowice;

- various actions undertaken by municipality.

1. Pre-design preparation:

- greenery inventory of trees on the area dedicated for ground level changes;

- indication of metallophyte plants spots on the area concerned;

- analysis of application possibility of inhabitants expectations.

2. Present state

Most of the surface of spoil heap area is covered by meadow of mixed herb plants and sparse woodlots. Majority of herb plants represent metallophyte species. They compose thermophilic plant communities with various aspects - dominated by thyme - *Thymus pulegioides*, sheep fescue - *Festuca ovina,* sand rock-cress - *Cardaminopsis arenosa,* bladder campion - *Silene vulgaris,* English plantain - *Plantago lanceolata,* compact dock - *Rumex thyrsiflorus* and mouse-ear hawkweed - *Hieracium pilosella*. Depending on season of the year or the very place these plants create color patches - rose, purple, green or yellow. The most frequent tree species are birch - *Betula pendula*, common aspen - *Populus tremula* and oak - *Quercus robur*. On southern slope dominate common pine - *Pinus sylvestris*. That last species can bring problems in future causing reducing of soil pH and rising possibility of contaminant solubility or bioavailability to the plants. Thus number of pine trees should be under control. All above the ground parts of mentioned herbs are contaminated, that can bring health problems to people while having frequent skin contact with them. Especially that may cause threat to children playing on grass there.

In northern part of area are sharp crags of height about 2-3m, above them steep slopes bringing danger of falling down to space users. Some patches uncovered by plants revealed rough spoil contaminated deposit. Partially one can find boulders of parched slag with sharp edges. They are present on northern slopes and in woodlots. There is a need to cut down dangerous crags, make even slopes and hide exposed parts of spoil heap material.

3. Construction design range

Design follow results of above actions and contain listed below elements:

- remediation and phytostabilization of top layer of the spoil heap;

- northern slope and spoil heap top formation;

- road path system;

- lighting design;

- surveillance infrastructure design;

- recreation infrastructure: view points, grill area, outdoor gym equipment, industrial playground, education path.

4. Design assumptions

Main problem and target of actions designed for area of zinc spoil heap in Ruda Śląska is the soil contamination and the process of the situation improving with remediation, to reach safe recreation open space there. Additional targets are: to mitigate dangerous sharp and high crags on the northern heap edge; build possibly low cost in maintaining leisure infrastructure with possibly broad offer, vandalism resistible, and with deep connections with local identity and history.

5. Remediation

Remediation of topsoil in the area concerned is provided by phytostabilization on the top of spoil heap and covering northern slopes with clay and new soil layers. That should prevent inhabitants from the contact with dangerous substances. That is important especially on the top of spoil heap where the most of sport and leisure activities will occur. To protect people against heavy metals present in metallophyte plants there is planned destroying of green cover on the spoil heap top with chemicals and replacing them with proper safe species. Southern slope will remain nearly untouched with minor activities provided. Nearly all designed activities are connected with northern and top area. For southern slope gradual exchange of plant species is planned, and will be realized by cutting grass before seed maturity and sowing target species of grasses, similar as for phytostabilization.

Phytostabilization design involves the reduction of the mobility of heavy metals in soil. That can be accomplished by decreasing wind-blown dust and minimizing of soil erosion according to creation of tight plant cover. Reducing contaminant solubility or bioavailability to the plants depends on pH level and presence of stabilizing substrate. The addition of soil amendments, such as brown coal, and alkalizing agents in form of lime fertilizers, can decrease solubility of metals in soil and minimize leaching to groundwater. Most of active

chemical compounds of heavy metals are blocked this way and neutralized. The mobility of contaminants is reduced by the accumulation of contaminants by plant roots, absorption onto roots, or precipitation within the root zone. To provide proper habitat for planned grasses there is designed addition of fertile soil to the top layer of the ground. There were chosen grass species especially suitable to limit contaminations in roots and restrain their migration to aboveground stems. Three species of grasses with diverse form varieties were used. They are Lolium perenne - rye grass, Festuca rubra - creeping red fescue and Miscanthus x giganteus - giant *miscanthus*. According to some scientific research these grasses can grow on zinc spoil heap habitat and have very limited traces of heavy metals in leafs. Phytostabilizing area - 12266m2, covering of northern slopes with clay and new soil area - 12366m2, southern slope for gradual species exchange - 17778m2.

6. Biodiversity

Plant cover appearing on spoil heap represents *xerophilic* or dry preferring plant communities. They are native and common for regional flora. It is inconvenient from the biodiversity protection point of view to destroy such green cover of top of the spoil heap, but it is necessary. Involved species of grasses except miscanthus are native too - Lolium perenne - rye grass, Festuca rubra - creeping red fescue. Trees planted there are mostly native too. Observing present composition of them were chosen *Betula pendula - silver birch, Quercus robur* - common *oak*, *Sorbus aucuparia* - common mountain ash and planted as a Land Art in form of green walls *Carpinus betulus* - common hornbeam. Southern slope enable limited plant succession with gradual rising of rye grass and creeping red fescue share. Some western parts of birch wood are generally left for natural spontaneous vegetation. Only at the base of southern slope are designed ornamental alien species, extremely resistible for dry soil. Some spots are indicated as "nature touch" or "plant signatures" - so called in Australia, with symbolic planting of native plants (abstraction from an actual plant community), they offer some „essence of the place". These spots are left untouched with metallophyte plants and can give an idea of natural colonization of zinc spoil heaps. The area except for playground located to the south of heap and playing field on the top of it will have limited maintaining. That should provide possibility for natural succession. On the edge of northern slope was noticed evidence of *Reynoutria japonica* - Japanese knotweed, invasive plant. During rebuilding of northern slope it should be destroyed, anyway it growth should be controlled in future.

7. Social participation

Since 2014 consultations were conducted with local community within the program called "Zintegrowany Projekt Przekształcania Kluczowych Przestrzeni Publicznych Obszaru Funkcjonalnego Chorzowa, Rudy Śląskiej i Świętochłowic".

The social needs and comments were indicated concerning:

- values:

  - accessible green open space, attractive landform, connections with wider open space system, neighborhood of shopping center;

- disadvantages:

  - lack of monitoring, menace of violent hooligan behavior, garbage in area, nearby industry, high voltage line;

- needs:

  - bicycle and ski infrastructure, sport facilities, view point, playground of industrial connotations;

According to that first consultations was designed first conception plan.

After thorough assessment of local conditions, threats and relations final conception plan was prepared in February 2017. Its assumptions were presented to local community on the meeting on 23.02.2017. Main direction of paths were kept as well as localization of playground, open space sports facility and playing field. Places for grill were moved to the west, to be far from high voltage line. New elements of functional structure were added - mentioned in description of construction design.

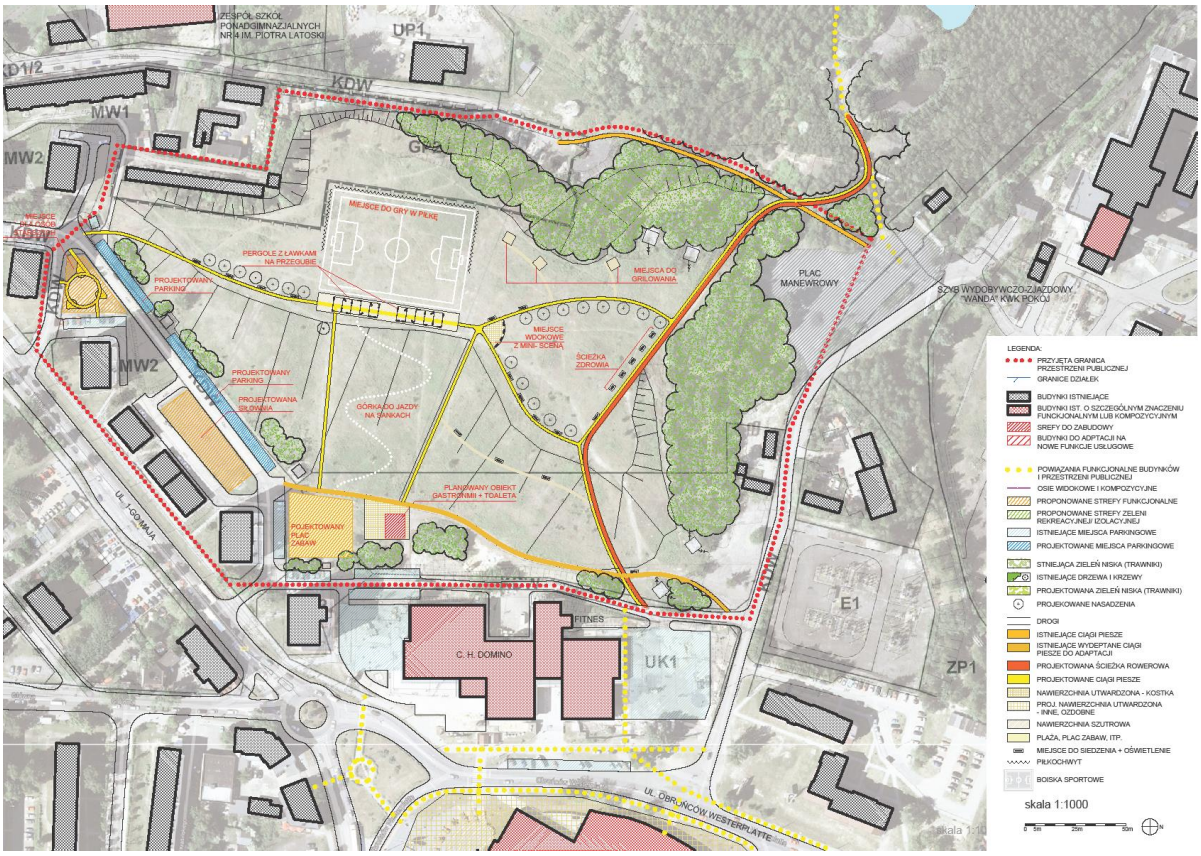

Fig. 1. First conception plan, ARCA, 2014

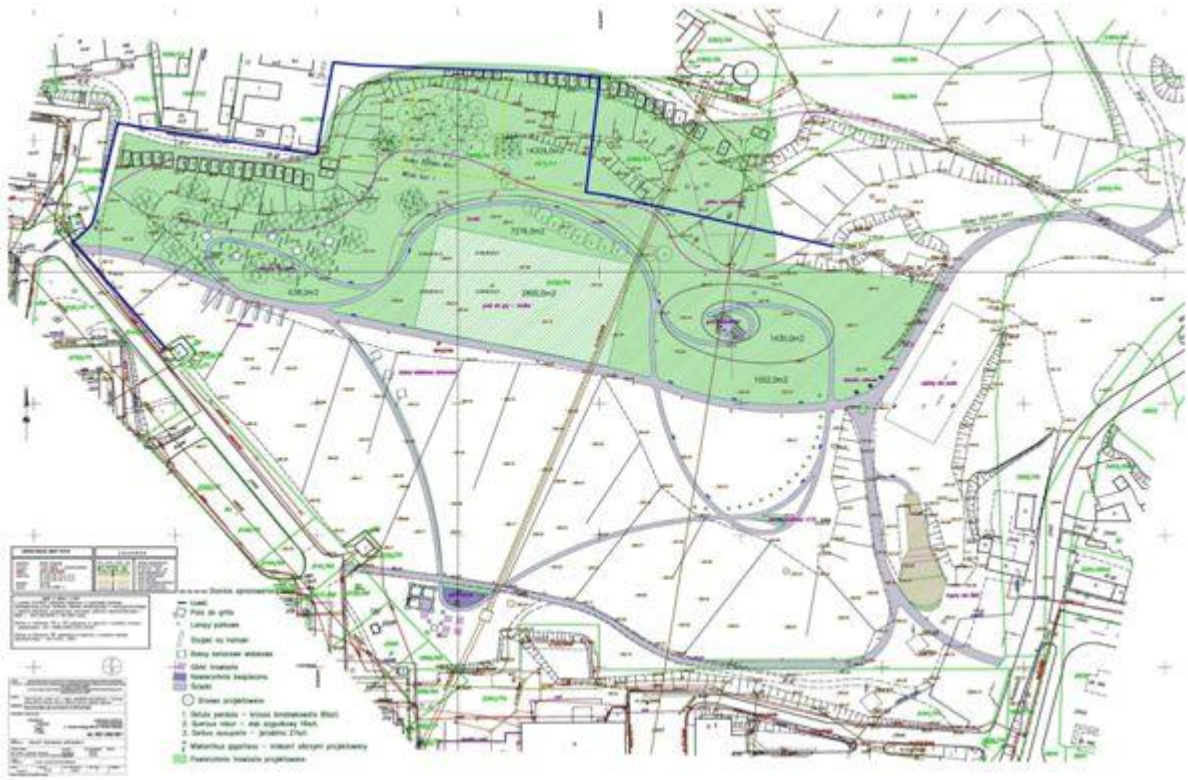

Fig. 2. Conception plan, HORTUS, 2017

F. Development elements

According to landform change northern slope is transformed. Limited part is left untouched as the „essence of the place" - high crag with moss and grass plant cover, with matured birch tree and some outcrop of spoil heap material with slag sinters. Some information points of educational path connected with slag features and metallophyte plants are placed nearby. The slope will be planted with birches, oaks and ash trees in geometrical groups to support expression of manmade landscape, but with use of native trees. On the area's northern edge Land Art is designed made of hornbeam trees. On the middle of heap top a view point is designed in form of hill about 5 m high. That will be made of spoil heap material and covered by clay, soil and sown by grass. There will be installed lunette, some benches and educational path point. To the north of the view point a sledge slope is designed. Other top area will be flattened and treated with phytostabilization to neutralize heavy metals contamination. To the west of the view point aq playing field is located. It will be sown more densely than other places, and will be well maintained. Around the playing field a low dike is designed with tubes-tunnels for children play. Furthermore to the west a grill area will be placed under canopy of birches. Places for grill stands will have form of gravel square pits surrounded by timber kerbs. Dark basalt gravel correspond to zinc slag but is not contaminated. Stands for grill will be separated by the dashed lines of miscanthus. That will give sense of intimacy providing kind of green wall maze for children play.

Fig.3. Development design, HORTUS, 2017

By the center of the area the main path will be built joining 1 Maja Street with "Trakt Rudzki" path. Near western end, on the place where the path will reach top ground platform concrete hammocks are designed. These constructions will have timber cover suitable to sit on and handles to mount own hammock. Leaving hammock for days in open space could be not reasonable because of possible vandalism and high fall of furnaces dust which makes textile dirty, especially during rainfall.

Quite near to them view concrete boxes are designed with two deck chairs in each. Intimate space, with view outlined by edge of box will have boards of educational path with information about local history, industrial revolution, zinc production technology, features of spoil heap material and metallophyte plants.

Fig.4. View boxes, HORTUS, 2017

Fig.5. Hammocks, HORTUS, 2017

To the south of main path three iron factory vats will be located on the slag spot. Vat will be filled with soil and planted *Lycium barbarum* - boxthorn. That shrub has falling down branches, bright silver-green leafs and can symbolize liquid metal in high temperature. Around vats there will be a small basin with slag gravel and educational board with zinc and iron production technology.

Near vats next group of hammocks will be placed.

On the side path curve a second - "small" view point is designed. Following that path one can find open space gym. There is either the place for boulder of zinc ore with educational board. Some additional hammocks stand there on the slope edge.

On the east border there is a jumping track for BMX bicycles located in dean made of coal mine rock. Slopes of dean will be covered by clay and grass. Track path will be covered by clay and lime gravel. The same surface is designed for BMX circus on an eastern border of the area. Circus has a form of round dike with ramps about 2m high, with walls suited to bike extreme rides and jumps.

Fig.6. Example of educational path boards

On the southern border another path going to the playground is designed. Most of the paths on the area concerned are covered by gravel and lime stone dust. Only two paths leading from the top of spoil heap to playground are designed of mineral-and-resin surface because of a steep slope. They provide extreme steep for walking path to give expression of spoil heap height. Along one of that paths there will be a line of slides for children play. On the main area of the playground a wooden construction is designed in the form of industrial structure with some connotations to coal mine lift tower, drift or some iron and zinc factory dwellings. Additionally various slides and modern play equipment were designed which may be associated with industry but giving at the same time a high quality play proposition.

On the southern slope some spots of metallophyte plants will be left. They will create rhythms of rectangular forms or will be designed as circles. Nearby there are educational boards put with information about that kind of plants.

On the whole area boards are designed of educational path with information about local history, industrial revolution, zinc production technology, features of spoil heap material, metallophyte plants, spontaneous flora, birds living around and area information system.

G.Recapitulation

Revitalization design for zinc spoil heap in Ruda Śląska is an attempt to solve as many as possible problems of the area concerned. According to the sustainable development rules technology of remediation and phytostabilization was taken under consideration and applied to all accessible area. On the northern slope the most heavy land formation works were designed to neutralize all health hazards connected with contamination and sharp crags. The slope will be flattened. Ground surface will be covered with clay and clear soil layer. Central area of the top of spoil heap will be treated with phytostabilization and southern slope will be maintained in the way to rebuild flora structure with the target to get plant cover not concentrating heavy metals in above the ground shoots. On that area recreation activities are highly limited.

All solutions should provide safe environment for people to rest, spend their leisure time and enable some sport activities with no health threat. Some limited parts of the area were left untouched to preserve local flora and provide source for natural succession. To support biodiversity nearly all trees designed are native. Most grass species except ornamental miscanthus are native too. Only groups of shrubs obscuring electricity transformer stations are introduced as ornamental plants with the highest drought tolerance.

Various small architectural forms and sport facilities were applied. The form of them should support local identity. Educational path is providing information about history of the place, industry connected with the area, local flora and fauna and sustainability issues.

Spatial and architectural solutions have original form and should be legible and easy to use. Small architectural elements, within that area information elements, are resistible for vandalism and possibly not too much expensive, easy to maintain, repair or exchange. All solutions were deigned to follow spatial, social, economical and natural demands of sustainable development and following ideas of green urbanism, the local action for biodiversity, European Landscape Convention and others.

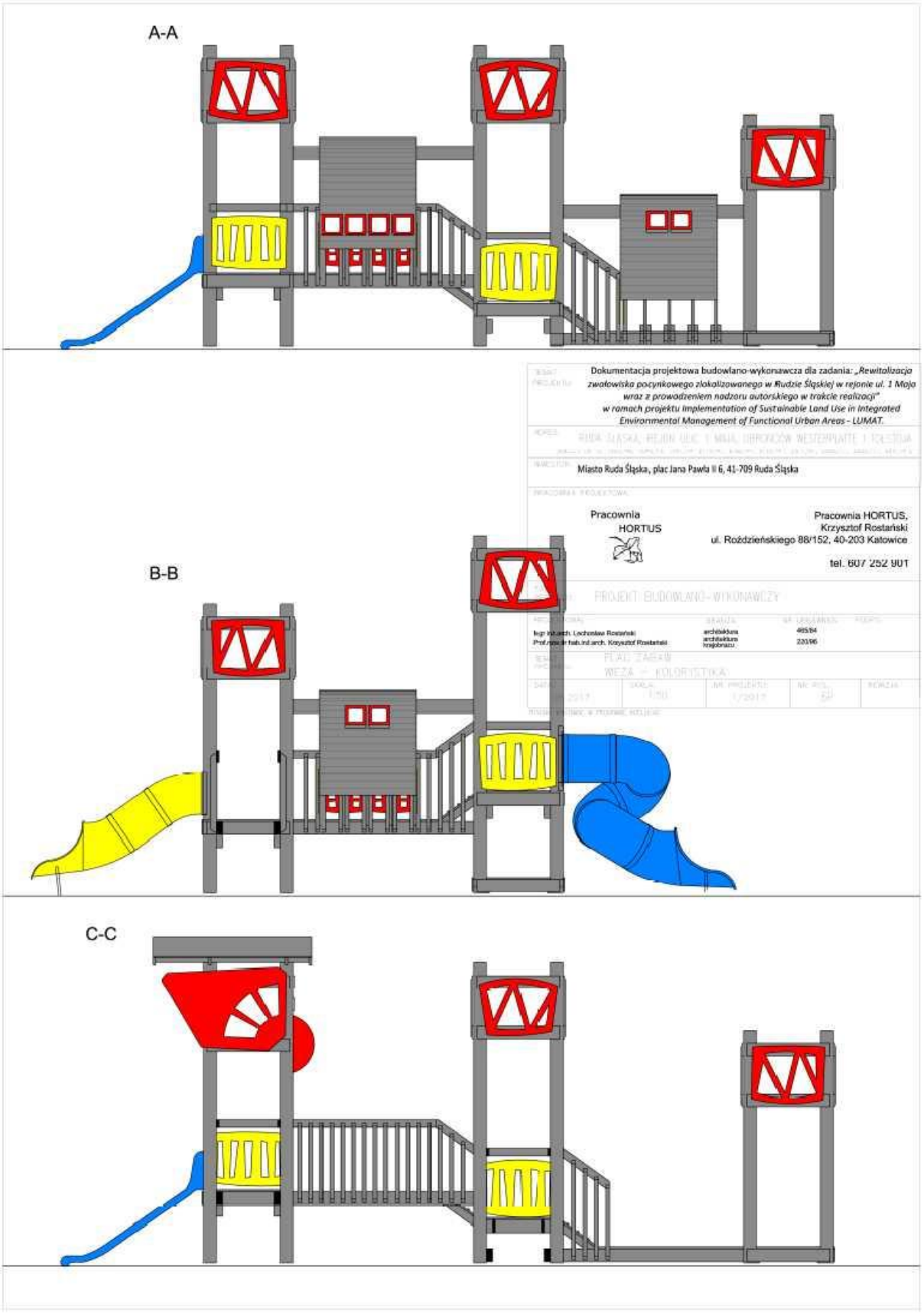

Fig.7. Wooden construction in the form of industrial structure on the playground. HORTUS

Design in numbers:

Construction area - 63 735m2

Northern slope for transformation - 12 366m2

Remediated area with phytostabilization - 12 266m2

Southern slope for gradual species exchange - 17 778m2

Bicycle facilities for BMX - 2 071m2

Path system - 4 387m2

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