



Client: Veolia Energia Polska S.A.

Project Phoenix

Traffic and Road Safety Impact Assessment
Final

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Project Context

Project Context

Veolia Energia Polska S.A. is planning the construction of an Energy Recovery Facility (ERF) on the idle land site adjacent to the existing EC4 plant operated by Veolia Energia Łódź S.A. (also part of Veolia Energia Polska S.A.) in the city outskirts of Łódź (Poland). The Project is being carried out by Veolia Nowa Energia Sp. z o.o. a special purpose company established for the purpose of implementing the investment Project, currently 100% owned by Veolia Energia Polska S.A. (part of the international capital Veolia Group).

The project involves the construction of an installation for thermal conversion of non-recyclable residual fraction from municipal waste in Łódź, which will constitute an important component of the waste management system in the Łódzkie Voivodeship. The Project will involve the construction of an Energy Recovery Facility (ERF) with a nominal capacity of 200,000 tonnes of waste per year with a nominal calorific value of 12.5 MJ/kg. Continuous operation of the facility 24 hours a day, 7 days a week is assumed. The facility will be equipped with two independent process lines for thermal waste conversion, each consisting of a grate boiler and a flue gas cleaning plant. Both process lines will be used to recover energy for the water/steam system working with a pressurised bleed and condensing turbine. Steam from the turbine (from the

bleed and/or from behind the turbine) will be directed to heat exchangers or to an air condenser. Thermal energy will be supplied to the municipal district heating network in Łódź and electricity will be supplied to the national grid.

The facility will use a high-calorific fraction of waste generated in the mechanical processing of mixed municipal waste, also known as pre-RDF (Refuse-Derived Fuel). It typically comprises materials that have not been previously separated during the selective collection process at source, such as plastics, textiles, etc. The Regulation of the Minister of the Environment of 9 December 2014 on the catalogue of waste defines the term as waste with code 19 12 12 - Other waste (including mixed substances and objects) from mechanical treatment of waste other than those listed in 19 12 11 and/or waste with code 19 12 10 - combustible waste (alternative fuel).

The thermal treatment of waste will result in the emission of various substances into the atmosphere. These emissions will depend on a number of factors, including the chemical composition of the waste, the process conditions and the application of waste gas cleaning technology. To ensure effective monitoring and treatment of waste gases, the plant will be equipped with a number of waste gas cleaning systems.

The facility will process 200,000 Mg of municipal waste per year under a cogeneration operation, which will result in the generation of:

- Electricity Production: 150 000 MWh;
- Heat Production: 470 000 MWh (1 700 000 GJ).

The generated heat will be received by Veolia Energia Łódź, and the electrical energy will be consumed by the thermal installation. Any surplus electrical energy beyond the internal requirements will be consumed externally, including by external consumers, such as Veolia Energia Łódź.

Project Context

The planned investment is located in Poland, in the city of Łódź (Łódź Voivodeship, Widzew district, Olechów-Janów residential area, J. Andrzejewskiej 5 Street, cadastral parcel 56/222, cadastral district W-32), next to the existing combined heat and power plant EC4 of Veolia Energia Łódź S.A., with buildings and facilities connected to the EC4 – referred to, within this document as **the Site**.

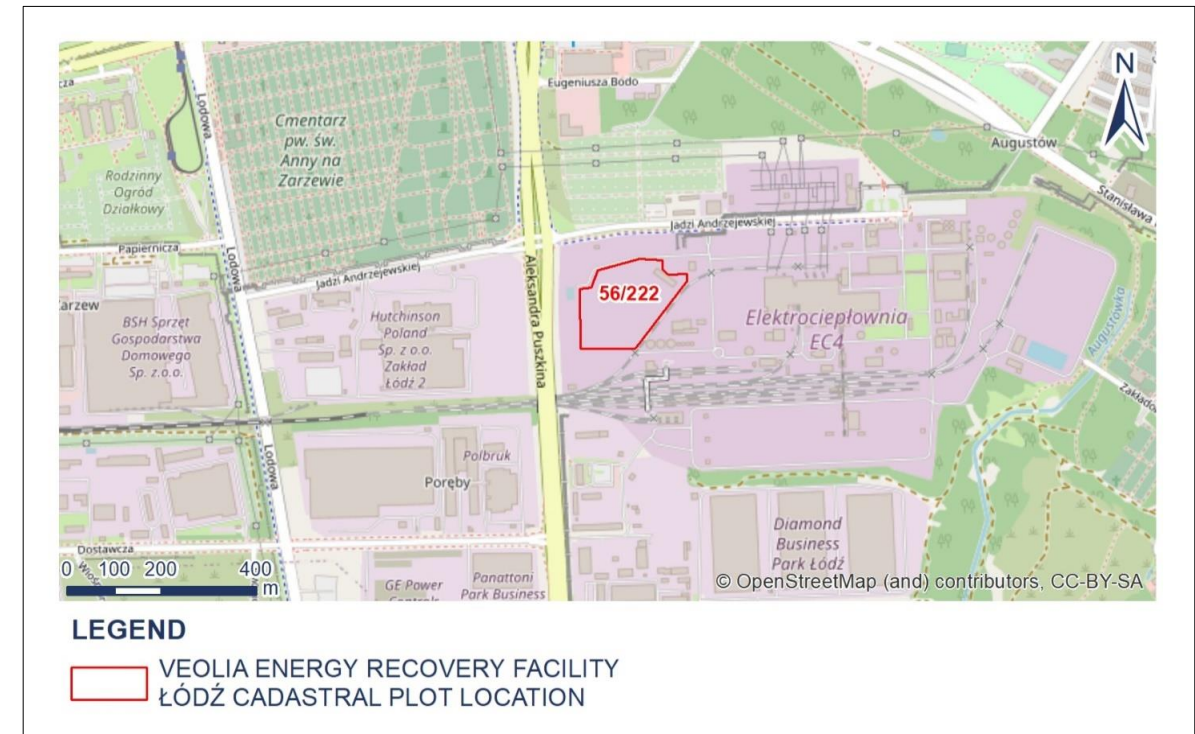
The investment area is located within an industrially developed area, in the city outskirts and away from residential and nature protected areas. The area of the project constitutes a typical anthropogenic landscape, being a part of an industrial facility. There is no natural plant cover on the grounds of the combined heat and power plant. This area is adjacent from the north-east to green areas covered in trees and bushes, which play a buffer zone between the combined heat and power plant complex and residential areas.

On the northern side of Jadzia Andrzejewska Street, there are the Elektron Family Allotment Gardens, alongside which commercial and service facilities and petrol station are situated. On the southern side, the plot borders railway tracks, and beyond them, there are industrial buildings and loading warehouses. On the western side, the plot directly borders Puszkina Street, and beyond it, there are industrial buildings and a cemetery Zarzew located to the northwest of the CHP4 plant. On the eastern side, there is a cemetery located. Beyond the gate of the CHP4, on the eastern side, adjacent to the Zakładowa Street, there is a stream called Augustówka.

There is no local spatial development plan adopted for the investment area. The area is located in a closed zone, meaning it is designated specifically for EC4 purposes. The area where the investment is planned, in accordance with the repealed spatial development plan for the City of Łódź dated June 2, 1993, resolution No. LVII/491/93, was located in areas previously designated for industrial-storage districts, industrial plants, and technical service areas of the municipality,

marked in the plan with symbol 16.05.03/P.Z1.1. According to the document “Conditions and Directions Study for the Spatial Development of the City of Łódź”, the planned investment is located in an area designated for construction, in a general urban zone marked with the symbol AG2, as a functional-spatial unit - areas for economic activities with significant inconveniences.

Location of the Project Site with surrounding



Introduction

Introduction

The purpose of this report is to establish and enforce appropriate constraints to minimize road-traffic collisions and ensure the implementation of effective traffic and road safety measures in terms of delivery of RDF to the Site, as well as transportation of post-processing waste from the ERF for further treatment.

The ultimate RDF supply partners for the Project have not been selected yet, however the Investor is considering a number of potential partners with Mechanical-Biological Treatment (MBT) facilities situated in various locations across Poland. As indicated in the map, with the current focus on seven market players, transportation of the fuel for the ERF could be expected in one case from within the City of Łódź and several cases from out of Łódź: from the North (1 facility), East (1 facility), South (9 facilities) or West (9 facilities).

All scenarios were covered within this traffic effectiveness and road safety analysis to provide clear guidance for the selection steps and selection criteria of the transportation route for the ultimate supplier, once chosen. The road route from the facility in the city of Łódź (the planned MPO MBT facility) to the ERF was examined in depth as an example of how traffic and road management systems will be approached for future routes within the city.

The analysis includes two options, to cover the best possible traffic and road safety evaluation methods of different locations of suppliers:

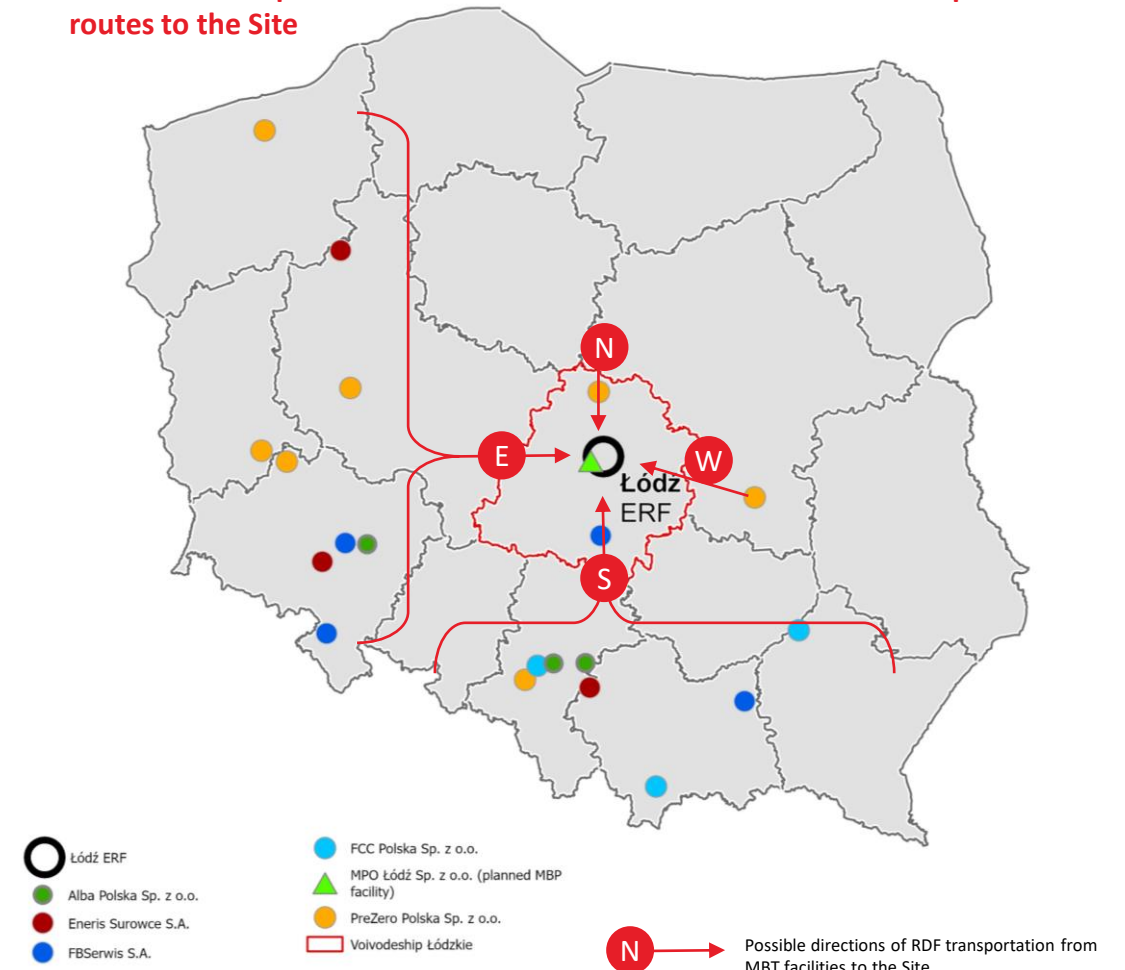
Option 1 – Supply from MPO Łódź, located at Zamiejska 1 Street, Łódź - considering access options within the city of Łódź;

Option 2 - Other partners across Poland - considering access options from key national roads.

The analysis was preceded by traffic impact assessment in the closest vicinity of the Site (entrance to J. Andrzejewskiej Str.) to assess the impact of additional traffic within the existing road infrastructure and current road traffic.

The Project definition was extended to include EC4 coal block closure (as associated facility), therefore heavy traffic resulting from EC4 will be included as decreasing the total traffic. Currently there are 19 vehicles operating daily to collect post-processing waste from the EC4. After EC4 closure these vehicles will no longer be operating and can be deducted from the ERF traffic values, resulting in decreasing the traffic impact.

Location of the potential MBT facilities with directions of RDF transportation routes to the Site



Introduction

GIS Analysis Methodology

The analysis included in particular:

- Analysis of **possible routes** from the RDF providers to the facility.
- Identification of road safety concerns and sensitivities along the route, e.g. as nearby residences, schools, hospitals, livestock movements, etc.
- GIS analysis of the existing environment, mapping sensitive locations/receptors, and predicting traffic impacts.
- An on-site visit to analyze road conditions and limitations of the road system in the vicinity of the ERF and along the example RDF transportation routes.
- Mitigation measures - outlining how project-affected communities will be protected and what temporary traffic control measures can be put in place.
- Addressing risks to project-affected communities from traffic movements and identifying potential risks to vulnerable groups, especially in areas with significant project activities or crossing public highways.

A quantitative analysis was conducted to facilitate selection of the ultimate route. The following methodological assumptions were considered:

Data sources:

- The analysis relies on the Topographical Object Database (PL: BDOT - Baza Danych Obiektów Topograficznych).
- An on-site study of the routes from the MPO facility to the ERF Site was conducted to validate road conditions and limitations as well as to collect photographic evidence.

Possible Routes:

Two options were considered:

- Option 1: three possible routes from the supplier to the ERF Facility were selected for analysis (A, B, C)
- Option 2: various possible routes were accounted for, however finally one optimal route was considered for the quantitative analysis (A1 Access)

Locations:

- The RDF recipient (ending point) is the ERF Site of Veolia Nowa Energia
- The RDF supplier (starting point) is located :
 - Option 1: MPO Łódź, Zamiejska 1 Str, Łódź.
 - Option 2: N, S, E, W directions from Łódź.

Analysis Objective:

- The primary goal was to compare potential routes for RDF transport to the facility to choose the optimal one in terms of traffic and road safety.

Buffer Creation:

- For each route, buffers were created based on road type and width.
- A 20 m buffer was included, representing the nuisance distance for heavy vehicle transport.
- Two buffer values were applied:
 - 45 m buffer for two-lane streets
 - 23 m buffer for one-lane streets

Building Identification:

- Buildings within these buffers were identified.
- The Topographical Object Database provided information for categorizing buildings into different groups.

Introduction

GIS Analysis Methodology

Weighting and Sensitivity:

- The weighting applied on building types is a reflection of social risk associated with transportation of RDF across urbanized areas (risks identified on [next page](#)).
- Each building group was assigned a weight based on its sensitivity to heavy vehicle transport. The higher the weight, the more risk is associated in terms of social impact.
- The final step involved calculating the total weight for each route.
- A higher value indicates greater sensitivity to heavy vehicle traffic.

Weighting system applied to the sensitivity analysis

BDOT building group	BDOT building group PL	Weight
Office buildings	Budynki biurowe	0
Commercial and service buildings	Budynki handlowo-usługowe	0
Residential buildings	Budynki mieszkalne	2
Educational, scientific and cultural building, sports buildings	Budynki oświaty, nauki i kultury oraz budynki sportowe	5
Production, service and farm buildings for agriculture	Budynki produkcyjne, usługowe i gospodarcze dla rolnictwa	0
Industrial buildings	Budynki przemysłowe	0
Hospital buildings and other healthcare buildings	Budynki szpitali i inne budynki opieki zdrowotnej	5
Transport and communication buildings	Budynki transportu i łączności	0
Other non-residential buildings	Pozostałe budynki niemieszkalne	1
Tanks, silos and storage buildings	Zbiorniki, silosy i budynki magazynowe	0

Source: Arup expert panel

Introduction

Risks & Mitigation Measures

Potential risks:

Potential risks associated with RDF transportation can impact various aspects and areas. General hazards include:

- **Local Community Impact:** Residents living near routes used by RDF transport vehicles may experience noise, vibrations, and other inconveniences. The impact on the local community's quality of life is an important consideration, hence this report includes consideration of this social impact through sensitivity analysis of specific types of buildings, where highest weights are assigned to **educational, scientific and cultural building, sports buildings and hospital buildings and other healthcare buildings**.
- **Road Safety:** Accidents related to RDF transportation pose a risk to drivers, pedestrians, and other road users. Adhering to safety measures and proper traffic management is essential, hence this report includes consideration of this social impact through sensitivity analysis of specific types of buildings where high weights are assigned to **residential buildings and other non-residential buildings**.
- **Environmental Pollution:** RDF transport can lead to emissions of air pollutants such as nitrogen oxides, suspended particles, and other substances. This can negatively affect air

quality in the vicinity of transportation routes. However, as indicated in Section [Traffic impact](#), the impact of additional traffic will be negligible (increase of between 1%-16% in total traffic on the intersections of closest streets).

- **Emergency Hazards:** In the event of accidents, breakdowns, or substance leaks related to RDF, there is a risk to human health and the environment. Preparedness plans and response procedures are necessary
- **Road Infrastructure:** Intensive RDF transport can result in wear and tear on road infrastructure, including road surfaces, bridges, and intersections. Additional investments may be needed for maintenance and repairs. However, as indicated in Section [Traffic impact](#), the impact of additional traffic will be negligible.

Mitigation measures

Mitigation measures are an important aspect in projects that impact communities. In the case of RDF transportation and post-processing waste transportation along urban routes, the most important measure to be considered is the development of **Traffic Control**, i.e. **implementing a plan for well-defined delivery routes**. The routes should be aligned with the findings of this report in order to minimize the impact on the community.

Other measures can include:

- **Communication and Education:** Informing the community about the planned project, its benefits, and safety measures is crucial. Educational campaigns can help people understand and accept the changes.
- **Air Quality Monitoring:** Installing air quality sensors in sensitive areas near the project site allows tracking of emissions and responding promptly if limits are exceeded. Temporary route changes for deliveries could be implemented based on monitoring results.
- **Emergency Preparedness:** Developing emergency plans and response procedures in case of accidents or incidents is essential.

Traffic impact

Traffic impact

Assumptions regarding the impact on road traffic on the entrance to J. Andrzejewskiej Street

This comprehensive analysis considers all directions of supply for Refuse-Derived Fuel (RDF) transport, regardless of the final option. The assessment relies on the following key assumptions:

- **Traffic Measurements:**

- The data used for this analysis were provided by the Client and were collected on February 19th and 20th, 2020, by Eutra Krzysztof Rosiek.
- These measurements specifically pertain to the intersection of Pushkin and Andrzejewska streets.

- **Transport Assumptions:**

- The transport of waste to and from the ERF in Łódź involves 54 vehicles per day in one direction.

- **Route Breakdown:**

While the analysis is not broken down into individual routes, the impact of traffic at specific locations was considered based on the option scrutinized:

- Option 1: Route A: Loc. 1,3; Route B: Loc. 2,3; Route C: Loc. 1,3
- Option 2: Loc.1,3.

- **Location-Specific Impact Assessment:**

Loc. 1 – Puszkin Street:

- A slight increase in general traffic (1%) and heavy traffic (6%) is observed.
- Due to the cross-section of the road (dual carriageway, two-lane), the additional traffic will not significantly affect its capacity.

Loc. 2 – Andrzejewskiej Street (west):

- Traffic at this location is currently very low (671 veh/day).
- Even with additional heavy traffic, there is no risk of overcapacity.

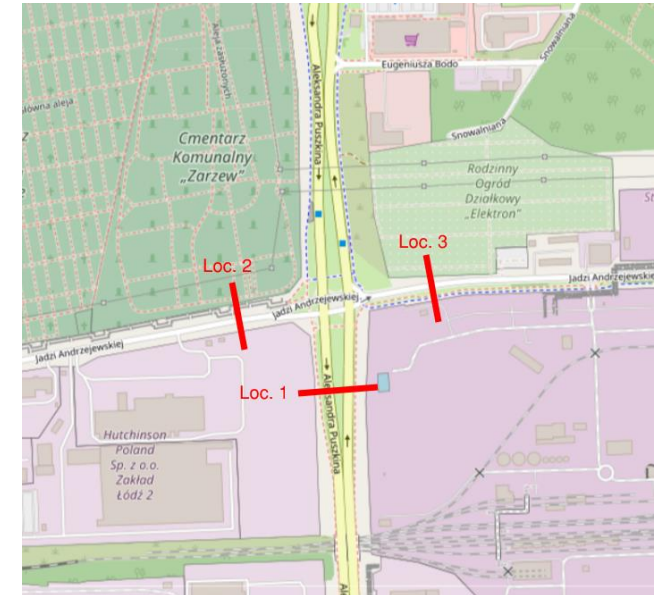
Loc. 3 – Andrzejewskiej Street (east):

- This road passes through industrial areas, where traffic predominantly consists of heavy vehicles.
- There is no risk of running out of capacity even with the additional RDF delivery traffic.

- **Conclusions:**

Based on the analysis of individual streets, it can be confidently concluded that **the impact of additional traffic will be negligible**. The existing road infrastructure can accommodate the proposed RDF delivery routes without creating significant traffic problems.

Including EC4 closure as associated facility to the Project will lead in the future to decreasing the total traffic by 19 vehicles operating daily, (heavy vehicles collecting post-processing waste – ashes - from the EC4). After EC4 closure these vehicles can be deducted from the ERF traffic values, resulting in further decrease of traffic impact.



Source: OpenStreetMap

Location	Average daily traffic [veh./day]	Heavy traffic [%]	Increase of daily traffic [%]	Increase of heavy traffic [%]
Loc. 1	19370	9%	1%	6%
Loc. 2	671	19%	16%	86%
Loc. 3	1682	14%	6%	45%

Overview of possible routes, traffic restrictions & conditions of the roads

Option 1 – RDF supplier – MPO Łódź

Overview of possible routes

Analysis of possible routes

The starting points for this analysis are the following locations:

- RDF supplier - MPO Łódź planned MBT facility, Zamiejska 1 Str.
- RDF recipient - Veolia Nowa Energia planned ERF Site, J. Andrzejewskiej 5 Str.

Analyzing possible travel routes at the initial stage: corridors that would be the shortest (and therefore fastest) paths between objects were identified. Next, they were examined in terms of passing through sensitive areas (such as residential neighborhoods, healthcare centres etc.), and types of roads with access permit for heavy goods vehicles. The analysis inferred that the key assumptions were as follows:

- The route should primarily follow dual carriageways with a high number of traffic lanes.
- These roads should serve as the main communication arteries within the city.
- Routing through residential areas and narrow streets with dense buildings should be avoided.

The results of these assumptions revealed three potential routes that were subject to further analysis:

- A. **The route runs on the central part of Łódź**, along the streets: Zamiejska, Pienista, al. gen. Zygmunt Walter-Janke aleja ks. bp. Władysław Bandurskiego, al. Adam Mickiewicza, al. marsz. Józef Piłsudski and Aleksander Pushkin to Jadzia Andrzejewska
- B. **The route runs on the more southern side of the city**, along the following streets: Zamiejska, Pienista (like Trasa A), then Obywatelska, Aleja Jana Pawła II, Pabianicka, Ignacy Paderewskiego, al. March. Edward Śmiegly-Rydz, Stanisław Przybyszewski, Aleksander Pushkin to Jadzia Andrzejewska
- C. **The route coincides with Route B** on the section: Zamiejska, Pienista, then Obywatelska, al. Jana Pawła II, Pabianicka, Ignacy Paderewskiego, al. marsz. Edwarda Śmiegly-Rydz and further along the streets: gen. Jarosława Dąbrowskiego, Aleksandra Puszkina to Jadzia Andrzejewska.

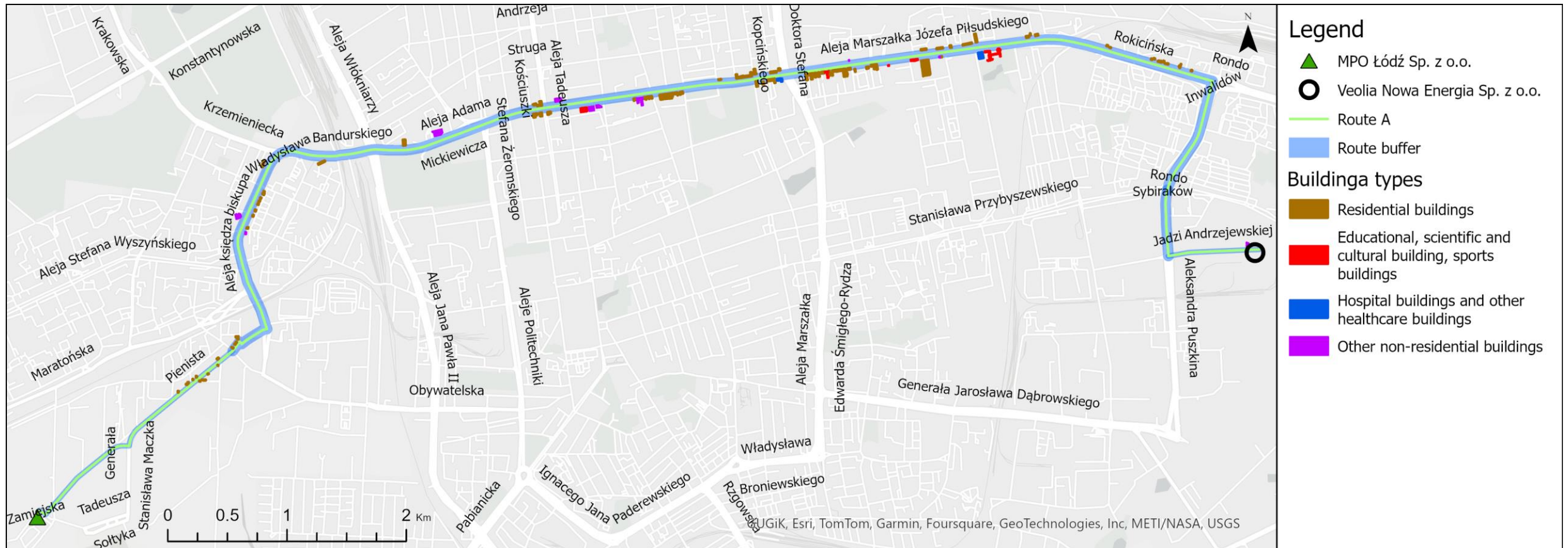
The further analysis of each route includes:

- Verification of potential traffic restrictions - e.g. tonnage, vehicle height, entry bans.
- Assessment of the condition of roads on individual sections to ensure they can accommodate RDF delivery vehicles.

- Road safety concerns and sensitivities along the route, e.g. as nearby residences, schools, hospitals, livestock movements, etc.
- Analysis of the impact of additional delivery traffic on the entrance to Jadzi Andrzejewskiej Street based on traffic measurements provided by the Client.

Option 1 – RDF supplier – MPO Łódź

Route A - overview



Option 1 – RDF supplier – MPO Łódź

Route A – traffic restrictions & conditions of the roads

Traffic restrictions:

- At the entrance to Łódź there is a ban on the entry of heavy goods vehicles over 12 tonnes and it does not apply to target entries in the city. Due to this arrangement, it is imperative that delivery drivers have the appropriate transport documents in the event of an inspection.
- No other traffic restrictions were observed.

Condition of the roads:

Zamiejska:

- A short section has a bituminous surface in good technical condition.
- No road markings.

Pienista:

- The street is paved with concrete slabs of medium or poor technical condition up to the intersection with Maczka Street.
- Only in the area of intersections does it have a bituminous surface.
- Further from Maczka Street to the

intersection with al. gen. Zygmunt Walter-Janke, it has a bituminous surface of good and medium, and locally poor, technical condition.

al. gen. Zygmunt Walter-Janke & al. ks. bp. Władysław Bandurskiego:

- Three-lane dual carriageways in good technical condition.

al. Adam Mickiewicza:

- Three-lane dual carriageways in good technical condition.

al. marsz. Józef Piłsudski & Rokcińska:

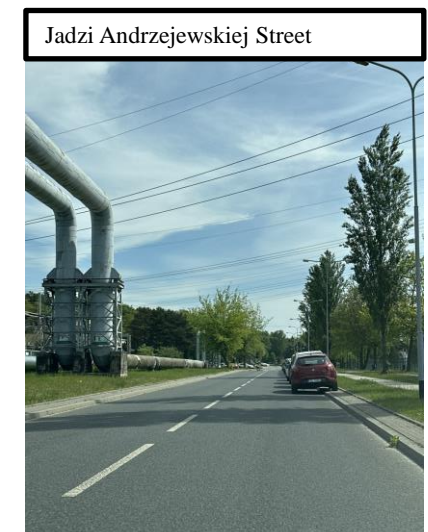
- Three-lane dual carriageways in good technical condition.

Aleksander Pushkin:

- Three-lane dual carriageway in medium technical condition.

Jadzi Andrzejewskiej:

- Single-carriageway, two-lane road in good technical condition.



Option 1 – RDF supplier – MPO Łódź

Route B – traffic restrictions & conditions of the roads

Traffic restrictions:

- At the entrance to Łódź there is a ban on the entry of heavy goods vehicles over 12 tonnes and it does not apply to target entries in the city. Due to this arrangement, it is imperative that delivery drivers have the appropriate transport documents in the event of an inspection.
- During the site inspection, renovation works were carried out on a significant section of Przybyszewskiego Street.

Condition of the roads:

Zamiejska, Pienista:

- Described at Route A.

Obywatelska:

- Single-carriageway, two-lane road.
- Good and medium, and locally poor, technical condition.

Al. Jana Pawła II:

- Three-lane dual carriageways in good technical condition.

Pabianicka:

- Three-lane dual carriageways in good technical condition.

Ignacy Paderewski & al. marsz. Edward Śmiegly-Rydz :

- Two/three-lane dual carriageways in good technical condition.

Stanisław Przybyszewski:

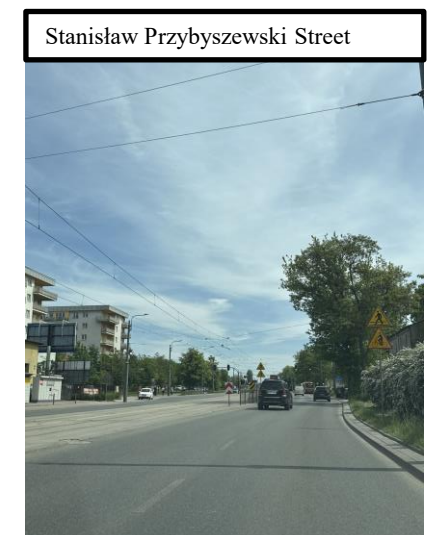
- Three-lane dual carriageways in good technical condition.
- Part of the road during renovation.

Aleksander Pushkin:

- Two-lane dual carriageways road.
- Good and medium technical condition.

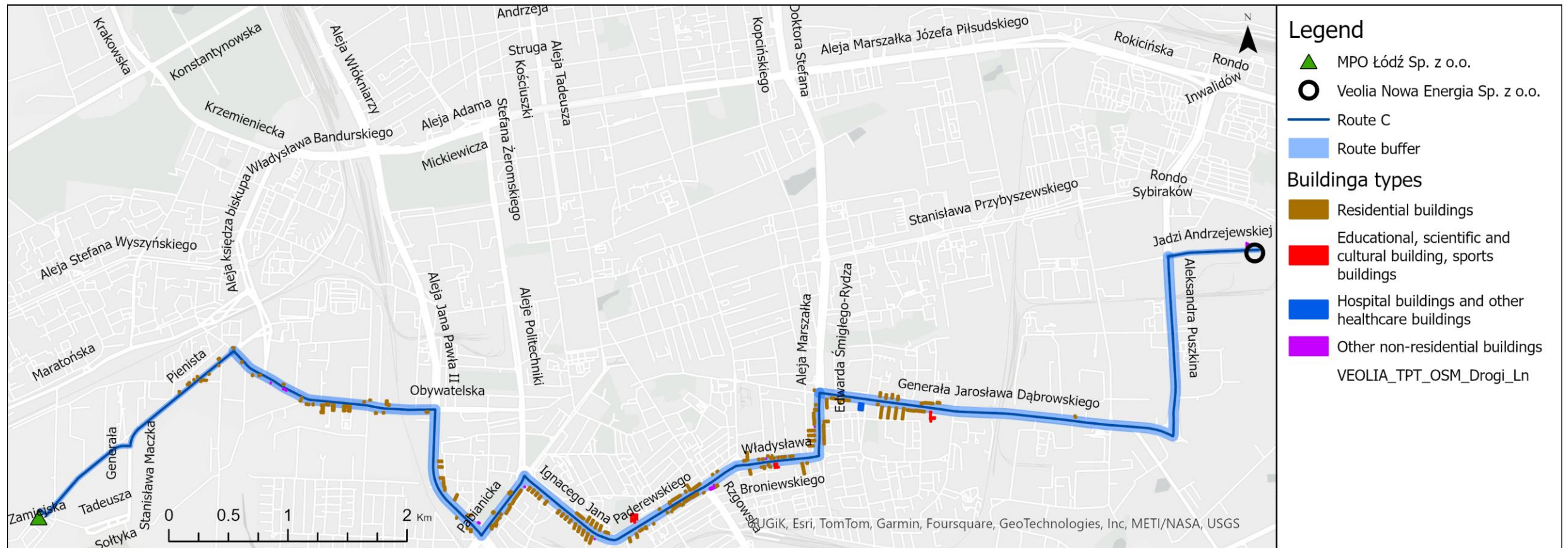
Jadzia Andrzejewska:

- Described at Route A.



Option 1 – RDF supplier – MPO Łódź

Route C - overview



Option 1 – RDF supplier – MPO Łódź

Route C – traffic restrictions & conditions of the roads

Traffic restrictions:

- At the entrance to Łódź there is a ban on the entry of heavy goods vehicles over 12 tonnes and it does not apply to target entries in the city. Due to this arrangement, it is imperative that delivery drivers have the appropriate transport documents in the event of an inspection.
- No other traffic restrictions were observed.

Condition of the roads:

Zamiejska, Pienista:

- Described at Route A.

Obywatelska:

- Described at Route B.

Al. Jana Pawła II:

- Described at Route B.

Pabianicka:

- Described at Route B.

Ignacy Paderewski & al. marsz. Edward Śmiegly-Rydz :

- Described at Route B.

gen. Jarosława Dąbrowskiego:

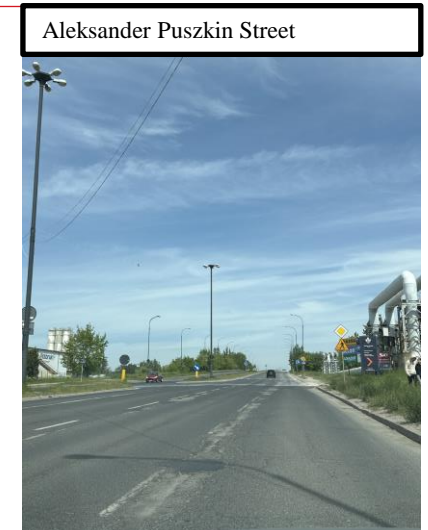
- Two/three-lane dual carriageways in very good technical condition.

Aleksander Pushkin:

- Two-lane dual carriageways road.
- Good and medium technical condition.

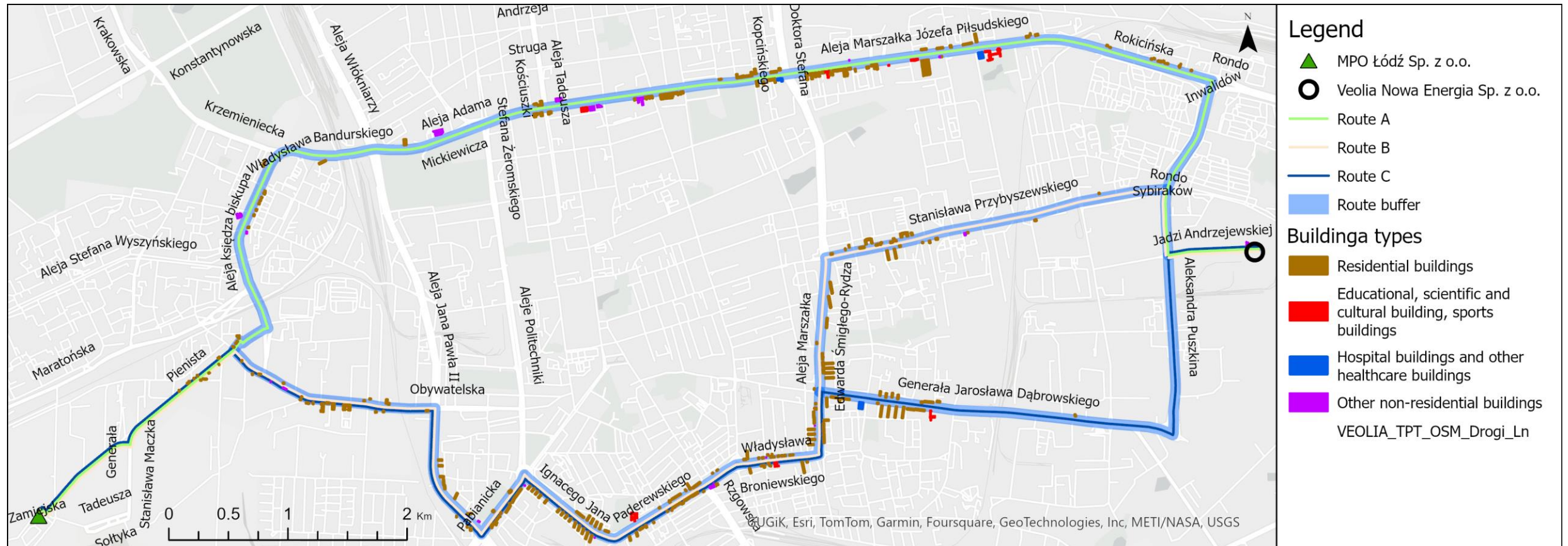
Jadzia Andrzejewska:

- Described at Route A.



Option 1 – RDF supplier – MPO Łódź

Routes overview



Option 2 – RDF supplier – Other partners throughout Poland

Overview of possible routes

Analysis of possible routes

Starting Points and Recipient:

- RDF Supplier: Any location in Poland N, S, E, W of Łódź
- RDF Recipient: Veolia Nowa Energia planned ERF Site, J. Andrzejewskiej 5 Str.

Considerations for evaluation:

- Travel time: The time it takes for deliveries to reach the Recipient.
- Road categories and classes: different types of roads (e.g., highways, expressways, local roads).
- Proximity to residential buildings and sensitive facilities: Ensuring minimal impact on communities and sensitive areas.

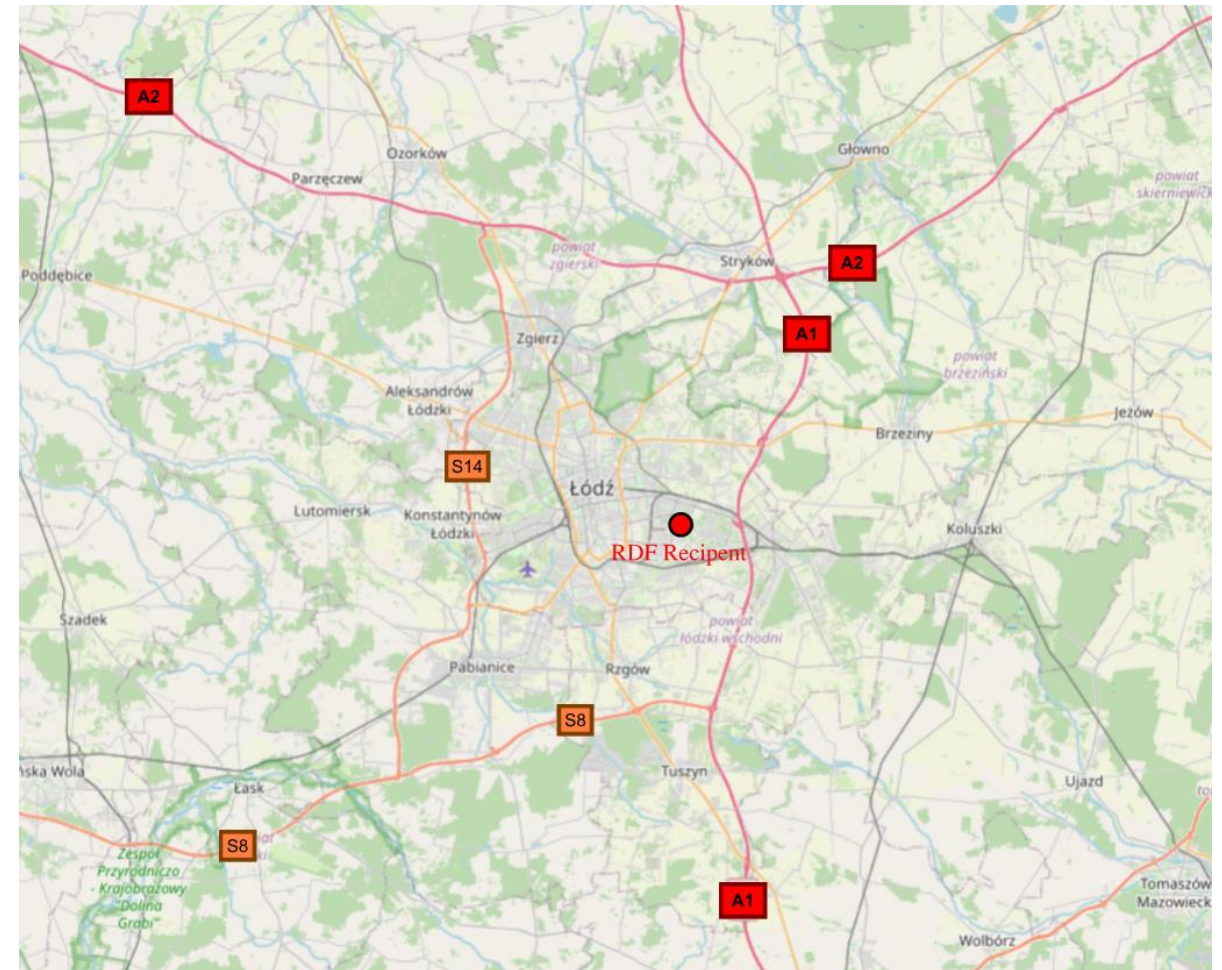
Main Assumptions:

- Prioritize using national roads for transportation.
- Optimize travel routes to be as long as possible on the main roads.

Final conclusion:

- Regardless of the direction of supplies from all over the country, the best access (and least burdensome) is provided by the **A1 (E75) motorway**.
- The A1 motorway connects with the A2 motorway (in the north) and the S8 expressway (in the south).
- Notably, the A2 motorway runs in close proximity to Veolia Energia Łódź S.A.'s installation on its eastern side.

In summary, the road network analysis suggests that using **the A1 motorway**, along with its connections to other major roads, offers the **most efficient access for RDF supplies to the Site**.



Source: OpenStreetMap

Option 2 – RDF supplier – Other partners throughout Poland

Main access, traffic restrictions & conditions of the roads

Access from the A1 motorway to RDF Recipient

Access from the A1 motorway is provided through the Łódź Wschód junction (junction no. 22 on the A1).

Further on, the route runs along a short section of Cezary Józefiak Avenue, and then Rokcińska Street to Pushkin Street. The last section runs along Andrzejewskiej Street. The route in question is about 6.6 km long.

Traffic restrictions:

At the entrance to Łódź there is a ban on the entry of heavy goods vehicles over 12 tonnes and it does not apply to target entries in the city. Due to this arrangement, it is imperative that delivery drivers have the appropriate transport documents in the event of an inspection.

Condition of the roads:

Cezary Józefiak Avenue is a two-lane dual carriageway road in very good technical condition.

Rokcińska Street is a street with the status of a voivodship road (DW713) with a two-carriageway, three-lane cross-section. The road is in good or very good technical condition.

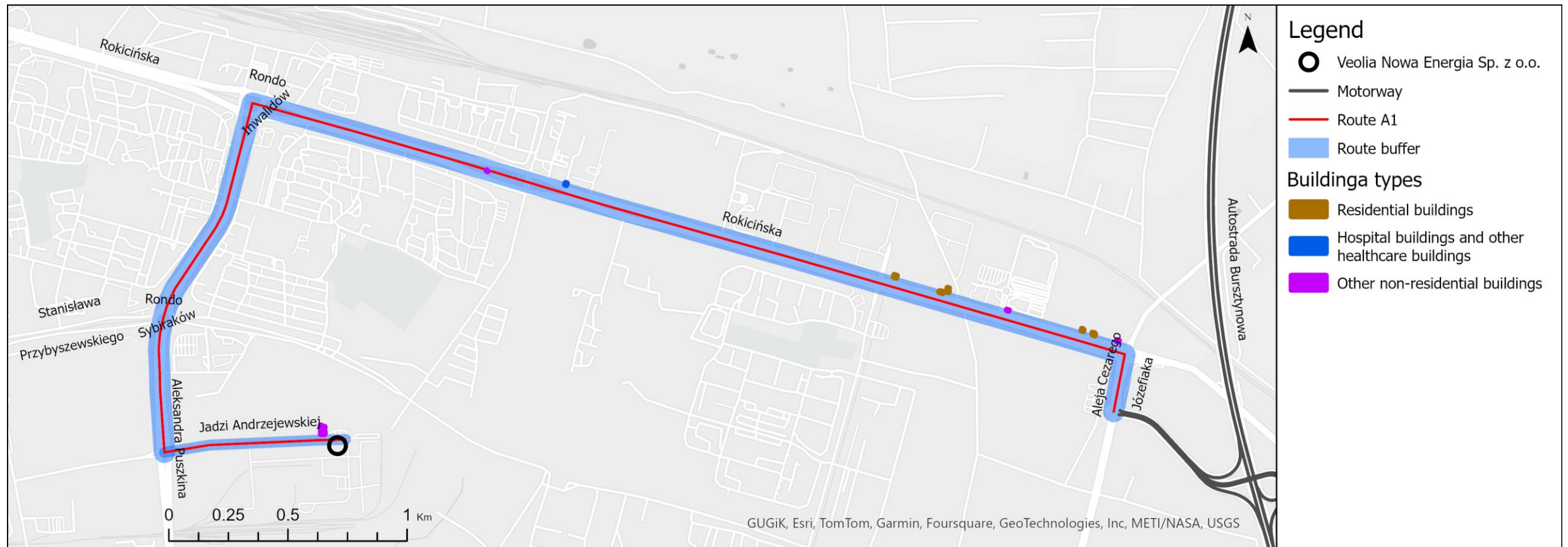
The sections of Pushkin and Andrzejewskiej Streets is described in Section Route A – traffic restrictions & conditions of the roads.



Source: OpenStreetMap

Option 2 – RDF supplier – Other partners throughout Poland

Route - overview



Sensitivities along the routes

Sensitivities along the routes

- All individual routes analyzed in Option 1 are of similar length – the evaluation criterion was not differentiating and was not taken further into account when comparing individual routes within this option.
- Basing on the BDOT database and the on-site assessment, along each of the individual routes the number of buildings within each identified building type was calculated, no matter the weight assigned.
- The table **Number of buildings (objects) along individual route options** on [next page](#) reflects the actual number of all identified buildings across the route:
 - Within Option 1 the biggest number of buildings is within Route B, while the smallest – within Route A.
 - Option 2 accounts for smallest number of buildings across the Route (it is also the shortest route)
- The weighting was then applied on building types as a reflection of social risk associated and multiplied by the number of buildings within each type on each individual route.
- The table **Sensitivity of buildings (objects) along individual route options** on [next page](#) reflects the risk weight identified buildings across the route.
- The higher the score, the more social risk from heavy vehicle traffic is assumed.
 - Within Option 1 the highest sensitivity score, i.e. least recommended is Route B, while the lowest sensitivity score, where social impact is assessed as lowest and hence recommended – Route A.
 - Option 2 proves the dedicated route provides an optimal solution in terms of social impact for transportation beyond the City of Łódź.

Sensitivities along the routes

Number of buildings (objects) along individual route options

Option	Route option	Route length	Office buildings	Commercial and service buildings	Residential buildings	Educational, scientific and cultural building, sports buildings	Production, service and farm buildings for agriculture	Industrial buildings	Hospital buildings and other healthcare buildings	Transport and communication buildings	Other non-residential buildings	Tanks, silos and storage buildings	Total
Option 1	Route A	14,5 km	15	33	110	5	44	6	3	9	11	3	239
	Route B	14,6 km	14	91	194	2	65	6	0	10	11	8	401
	Route C	14,5 km	16	79	169	3	50	7	2	10	10	11	357
Option 2	A1 Access	6,4 km	4	11	6	0	8	0	1	14	4	3	51

Sensitivity of buildings (objects) along individual route options

Option	Route option	Route length	Office buildings	Commercial and service buildings	Residential buildings	Educational, scientific and cultural building, sports buildings	Production, service and farm buildings for agriculture	Industrial buildings	Hospital buildings and other healthcare buildings	Transport and communication buildings	Other non-residential buildings	Tanks, silos and storage buildings	Total score
Weight of building type			0	0	2	5	0	0	5	0	1	0	
Option 1	Route A	14,5 km	15	33	110	5	44	6	3	9	11	3	271
	Route B	14,6 km	14	91	194	2	65	6	0	10	11	8	409
	Route C	14,5 km	16	79	169	3	50	7	2	10	10	11	373
Option 2	A1 Access	6,4 km	4	11	6	0	8	0	1	14	4	3	21

Conclusions

Sensitivities along the routes

Conclusions

- In the case of deliveries within the city (Option 1), the best option is to drive through the city. However, if the delivery point is outside Łódź, the most efficient option is to use the A1 motorway (Option 2).
- The analysis of sensitive object along the transportation routes indicates that within Option 1 Route A is the optimal (causing least social impact) considering the lowest final score and will be recommended for the transportation of RDF from the MPO Łódź to the ERF Site.
- For all transportation routes from beyond the City of Łódź (Option 2) the A1 motorway was selected as the most efficient access for RDF transportation to the Site.
- On analyzing the results for individual building types it occurs that Route A, despite running in the vicinity of fewer residential buildings, has a greater impact on most sensitive buildings - educational, scientific and cultural buildings, sports buildings, hospital buildings and other healthcare buildings. However, their number on the short distance is very small – these are only individual buildings - and will not affect the overall impact assessment.
- What is worth noting, during the on-site inspection, significant traffic congestions were observed on Route A, and the travel time was c.a. 10 minutes longer compared to other routes. Nevertheless, taking into account significant differences in the proximity of sensitive facilities, this does not constitute a significant limitation and should only be taken into account in emergency situations. The **time factor was hence not assessed as a critical factor** to consider for route selection.
- For the specific origin-destination pair analyzed, i.e. MPO Łódź (Zamięjska 1 Str., Łódź) to Veolia ERF Łódź (J. Andrzejewskiej 5 Str., Łódź) **transport should be carried out mainly along Route A, with Route C serving as an alternative (in the event of traffic disruptions, temporary closures or detours).**
- The specific example serves as an indication for future route selection process, when considering traffic and road safety for the ultimate RDF supplier to the ERF, as well as transportation of post-processing waste from the ERF for further treatment.
- The final recommendation is to select the route following steps and selection criteria identified and described above, in particular with consideration of:
 - Whether Option 1 (transportation within the city) or Option 2 (transportation beyond the city) is being realized
 - Traffic restrictions
 - Road conditions
 - Sensitivity of specific building types.
- It is recommended regularly updating the analysis to reflect any potential changes in the urban space.

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