

Between the Rails

Transformation of a former rail segment in Vienna, Austria with strategies for integrating biodiversity in limited urban spaces

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Project: 2024 Master Thesis Project Landscape Architecture

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— Alvar Aalto

ABSTRACT

Between the Rails focuses on the

transformation of a former railway segment in Vienna's developing Brigittenau district, which is situated between the Danube and the Danube Canal. The site has been unused since 2016. It connects the Nordwestbahnhof, an area now planned for development, to the Danube.

Between the Rails aims to design new lungs for a city landscape—a space which not only serves residents in everyday use, but one which is also an active living system that enhances quality of life and helps ensure a more liveable urban world in a future facing the rapidly intensifying effects of climate change. In dense urban landscapes, ground for open space is rare and valuable. Between the Rails focuses on bringing out the maximum potential recognising the value not only for the human residents, but also for native species which, in turn, will contribute to a healthier future urban climate and a higher quality of life. Therefore, a central task taken in this project is to strategically meet varied goals within a limited space.

When one looks closely, a variety of life can thrive in difficult places, even between old train rails. The project explores the claim that even such seemingly small, left over, suboptimal spaces have high potential. And by reading between the lines of this rail's contemporary state, it becomes apparent that a wealth of ecological, social, and economical history have informed its existence, and that these can be driving factors for creating a space that has strong place specific identity.

In this sense, the project is also about giving back: giving back a strip of land that now physically divides a landscape to its community; giving back a historical space of gathering and festivity of all classes to the people; and giving back space to biodiversity, which once was particularly rich in this floodplain landscape. Devoting valuable, limited space to support more life is also a healing gesture in a landscape where so many lives were taken under the National Socialists.

To directly support the district's community as specifically as possible, the project must also respond to diverse areas with different strategies. In some segments, the design meets the needs of a more established context. In others, it provides structure to create a functional, usable space, but one that can also change, and ideally expand, as the context develops.

The strategies developed for this site could be widely applicable to other urban contexts facing the impacts of climate change alongside the challenges posed by densification. Providing usable green space that benefits a diverse and changing community is vital, but building a healthy, resilient urban environment that's stronger and more liveable in a changing climate is critical as well. Successfully supporting both of these needs in a limited space is the central focus of this project, and it is also one which cities in general will increasingly need to address.

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Fig. 01, author's photographs of the site and Brigittenau district

1 | ANALYSIS

Historical, Social, Economical, and Ecological Assessment of the Project Site and Context

1.1 History

Vienna and the River Danube

Vienna and its river have formed each other. The landscape has been altered many times through both natural forces such as changes in the riverbed and flooding and through the human efforts to control the water's shaping power. Flooding has threatened the Vienna area and its growing developments for centuries. As far back as the year 1012, deaths and damage to buildings and agriculture were recorded.² The first regulation of the Danube was completed in 1875.³ This alteration of the riverbed significantly changed the city's landscape and defined the organisation of more recent developments, including the area of the project site.

The origins of the Austrian capital date back to the first century AD, with Vindobona, a Roman military camp, located in today's city center. Not much is known about the settlement between a major fire in the 5th century and the 9th century, which must have survived at a small scale, with the first churches being established in the 800s.⁴ Around 1200, the medieval city wall was constructed. Vienna's power grew as part of a trade network, and the Danube was a critical part of this progress, providing strong connections to Venice. The city flourished and experienced considerable growth during this time.⁵ Into the late medieval period, trade and wine production dominated the economy.⁶ In the 16th and 17th centuries, two Turkish sieges were consequential in restructuring the cityscape, not only in its fortifications, but also in its style; particularly after the destruction of the second siege, extensive construction rebuilt and expanded Vienna, with a pronounced baroque architectural style.⁷

While the Danube had supported settlement, it had also been a treacherous force in the landscape, both because of its flooding and the perils faced by those travelling by boat. The mid-18th century marks a turning point in humans' relationship to the river. At this time, the Danube became seen as something to be "civilised" and controlled, and from that point on, human interference in and reshaping of the river landscape was significant. In less than a century, transformations resulted in the disappearance of many wetlands and the disconnection of alluvial forests from the river.⁸

In Vienna, land management and development patterns changed dramatically after the revolution of 1848. The government then had more control over land and used this power to organise districts and build into suburban zones. The most significant

⁶ "Late medieval Period, The—History of Vienna" <u>https://www.wien.gv.at/english/history/overview/medieval.html</u> (22.11.2023)

⁷ "Period of the Turkish Sieges (1529 to 1683), The—History of Vienna" <u>https://www.wien.gv.at/english/history/</u> <u>overview/turks.html</u> (22.11.2023).

² "Wassergewalten" Berzirksmuseum Leopoldstadt. <u>https://bezirksmuseum1020.wordpress.com/hochwasser/</u> (22.11.2023)

³ "1. Donauregulierung" Berzirksmuseum Leopoldstadt. <u>https://bezirksmuseum1020.wordpress.com/1-donauregulierung/</u> (22.11.2023)

⁴ "From the Roman Military Camp to the End of the First Milenary—History of Vienna" <u>https://www.wien.gv.at/english/</u> <u>history/overview/romans.html</u> (22.11.2023).

⁵ "Rising to the Rank of a City—History of Vienna" <u>https://www.wien.gv.at/english/history/overview/rising.html</u> (22.11.2023).

⁸ Schmid, Martin,/ Haidvogl, Gertrud,/ Friedrich, Thomas,/ et al.: "The Danube: On the Environmental History, Present, and Future of a Great European River" in: River culture: life as a dance to the rhythm of the waters. UNESDOC Digital Library 2023; p. 637-671. <u>https://doi.org/10.54677/INTF8577</u> (08.12.2023).



alteration to the Vienna landscape was completed in 1875: the excavation of a new river bed, the regulation of the Danube. The area between the canal and the new main river which supported ships benefited economically from its location.⁹ This area includes today's Brigittenau district and the project site. The regulation of the Danube had great economic significance for Vienna because the new riverbed allowed for increased transport by water, both in the size and number of ships supported. It also meant

Fig. 02, Plan of the Danube Regulation from 1874

dramatic changes to the landscape, not only because a new large area was now dry ground available for construction and expansion of the city, but also because the threat of floods was greatly reduced.¹⁰ Figure 02 illustrates in solid red the buildable plots gained from the regulation of the river.

Though the regulation provided opportunity for growth and strengthened connections to international economies, it was a negative development from the perspective of the

⁹ "Ringstrasse-period, The—History of Vienna" <u>https://www.wien.gv.at/english/history/overview/ringstrasse.html</u> (22.11.2023).

¹⁰ Hachleitner, Bernhard,/ Hieslmair, Michael,/ Zinganel, Michael: Blinder Fleck Nordwestbahnhof Biographie eines innenstadtnahen Bahnhofsareals. Wien 2022.

river's ecosystem. The freshwater biodiversity of the Danube River Basin is one of the richest in Europe, and the east-west orientation of the river is one element that supports this, because it enables greater migration and recolonisation. Floodplain areas are some of the most significant places for biodiversity because of the transitional nature and links between phases of dry and wet and between terrestrial and aquatic habitats.¹¹ The area of which the Brigittenau district is now a part, that which was gained through the regulation of the Danube, was a floodplain area prior to industrial development and the regulation itself. Fig. 04 shows the extent of a particularly large flood in 1830, but through the overlay, it also demonstrates how the Danube prior to its regulation intersected what is now the densely built land between the Donaukanal and the main river. The loss of this significant portion of floodplain ecosystem due to human intervention particularly from the 1800s onward could therefore be understood as a notable loss of highly rich habitat in terms of biodiversity.

Dramatic physical transformation of the Danube and loss of valuable floodplain areas are not the only negative impacts of human activity on the valuable river ecosystem. More indirectly, pollution of the water through industrial activity has also been significant. Into the 20th century, areas downstream of major cities, including Vienna, were shown to have particularly low water quality.¹² The surrounding area of the project site, which grew out of industrialisation, would most certainly have been a contributor in terms of pollution of the Danube's ecosystems.



Fig. 03, the spread of settlements in the Viennese Danube floodplains 1704, 1849, 1912

¹¹ Schmid, Martin,/ Haidvogl, Gertrud,/ Friedrich, Thomas,/ et al.: "The Danube: On the Environmental History, Present, and Future of a Great European River" in: River culture: life as a dance to the rhythm of the waters. UNESDOC Digital Library 2023; p. 637-671. <u>https://doi.org/10.54677/INTF8577</u> (08.12.2023).

¹² Schiemer, Fritz: "Ecological status and problems of the Danube River and its fish fauna: a review" in RAP Publication, FAO & MRC, Large River Fisheries. 2004; p. 273-299. <u>https://www.researchgate.net/publication/</u>290485507_Ecological_status_and_problems_of_the_Danube_River_and_its_fish_fauna_a_review (08.12.2023).



Fig. 04, ice-surge flooding extent in 1830. Hohensinner, S. (2020): Historische Hochwässer der Wiener Donau und ihrer Zubringer. Materialien zur Umweltgeschichte Österreichs, Bd. 1, Wien.

The river was important for its fish, which fed residents and were also a part of the economy. The fishing industry, but also water pollution, had negative consequences for the Danube's fish. The regulation of the river, however, had some of the most dramatic impacts, changing the flow and structure and substantially altering or removing valuable habits that supported the diverse species.¹³

Brigittenau

The location of today's Brigittenau district, just north of the Augarten, which dates back to 1614 under Kaiser Maximilian as a hunting garden,¹⁴ was historically a floodplain area. (See Fig. 05) After the Vienna Danube Regulation (1868-75), the land was gained for development. It was recognised as a distinct district separate from Leopoldstadt, of which it was initially a part, in 1900. The district features no historical centre.¹⁵ This floodplain area was barely built up until the 1830s, aside from the Brigittakapelle of a couple centuries prior, as well as the use of parts of the land for kitchen gardens for the imperial court.¹⁶ Into the 18th century, popular inns were constructed and an imperial pheasant garden, made accessible to the public by Joseph II

(1741-1790), also became a feature. From 1775 until 1848, Brigittakirtag was celebrated annually in July on the first Sunday following the full moon. This fair, open to all social classes, attracted easily up to 80,000 visitors. These high numbers necessitated the building of a new bridge, the Friedensbrücke (formerly the Brigittabrücke). 1846 saw the clearing of the area's floodplains for the construction of factory buildings.¹⁷ Before this change to the landscape, only a few hand-craft businesses were present in the area, including a fire engine factory, a steam sawmill, and a sheet metal company.¹⁸ The industrial growth enabled by the 1875 regulation of the Danube brought in a fluctuating group of companies, among them several metal industries, which helped transform the district into a workingclass one where living standards were low, poverty was high, and a housing shortage was faced as immigrants came to the area for work.¹⁹ Industrial activity was a large part of the impetus for transforming the floodplain landscape of the Brigittenau into a buildable one.²⁰ It also continued to shape the area's development, one which flourished economically as a result of its location between the newly regulated Danube, which could support transport in much higher

¹³ Haidvogl, Gertrud,/ Hauer, Friedrich,/ Hohensinner, Severin,/ et al.: Wasser Stadt Wien Eine Umweltgeschichte. Wien 2019; p. 336

¹⁴ "Der Wiener Augarten" Österreichische Bundesgärten. <u>https://www.bundesgaerten.at/augarten/Augarten-.html</u> (22.11.2023).

¹⁵ "Bezirksgeschichte Brigittenau" <u>https://www.bezirksmuseum.at/de/bezirksmuseum_20/bezirksgeschichte/</u> (22.11.2023).

¹⁶ Haidvogl, Gertrud,/ Hauer, Friedrich,/ Hohensinner, Severin,/ et al.: Wasser Stadt Wien Eine Umweltgeschichte. Wien 2019; p. 144-147

¹⁷ "Die Geschichte von Wien-Brigittenau" <u>https://www.stadt-wien.at/wien/wiener-bezirke/die-geschichte-von-wien-brigittenau.html</u> (22.11.2023).

¹⁸ "Geschichte" <u>http://www.reiseweltatlas.de/wiki/Brigittenau_Geschichte-48835.html</u> (13.12.2023).

¹⁹ "Ausstellungen" Bezirksmuseum 20. Brigittenau. <u>https://www.bezirksmuseum.at/de/bezirksmuseum_20/</u> <u>ausstellungen/</u> (13.12.2023).

²⁰ "Die Geschichte von Wien-Brigittenau" <u>https://www.stadt-wien.at/wien/wiener-bezirke/die-geschichte-von-wien-brigittenau.html</u> (22.11.2023).



Source: WStLA

Fig. 05, Plan of the Brigitta Au and the Vienna Canals, 1796



Fig. 06, Jägerhaus and Chapel in the Brigittenau, 1820



Fig. 07, Brigittakapelle 1905

quantities, and the canal. Until the addition of the train station in the later 1800s, the Donaukanal was the main artery for trade traffic.²¹ While greater development of the Brigittenau district had been made possible

through the regulation of the Danube, this was delayed in the late 19th century by an economic crisis. However, the area proved to be suboptimal for desirable residential development as well, with factors including the physical separation of city areas by the station and rails, the presence of the quays which dominated the waterfront, and the steam engines' noise and soot.20

Notable Historic Landmarks

The name of the district references Saint Brigitta and a legend from the 17th century that resulted in the construction of a chapel dedicated to the saint. The chapel was a gesture of gratitude after the Archduke was barely saved from a bullet while praying in his tent.²² Built between 1645 and 1651 by Philiberto Lucchese, the Brigittakapelle remains an anchor in the area today as it was before the developments of the 1800s.²³ (See Fig. 06, 07, 08; in Fig. 05, the chapel can be

seen next to the well-marked Jägerhaus in the north-east corner of Brigittenau) The main circulatory element of the 17th century hunting garden (See Fig. 05, "Weg zum Jägerhaus") remains a central element of

²¹ Hachleitner, Bernhard,/ Hieslmair, Michael,/ Zinganel, Michael: Blinder Fleck Nordwestbahnhof Biographie eines innenstadtnahen Bahnhofsareals. Wien 2022.

²² "Bezirksgeschichte Brigittenau" <u>https://www.bezirksmuseum.at/de/bezirksmuseum_20/bezirksgeschichte/</u> (22.11.2023).

²³ "Brigittakapelle" <u>https://www.geschichtewiki.wien.gv.at/Brigittakapelle</u> (22.11.2023).



movement today as the Jäger Straße, a form it already held in the mid-19th century.²⁴ In 1873, the Neo-Gothic brick Brigittakirche by Friedrich Schmidt was construction and is still one of the landmarks of the district.²⁵ During the second world war, the district lost many buildings to bombing. The Brigittakirche was among those notable structures that were severely damaged. The Millennium Tower, which today has become a contemporary landmark of the district, was opened in 2000.²⁶

1.1.1 History of the Site

As discussed in greater depth in chapter 1.1, the site's landscape was naturally a floodplain. Unlike other areas of today's 20th district, it was not, however, part of a former riverbed of the Danube. Regulation of the river made significant amounts of buildable land available in the location east of the current rail

Fig. 09, Nordwestbahnhof, Ausfahrt der Bahnhofshalle, 1871

segment, between it and the new riverbed. In June of 1872, the Nordwestbahnhof was built. It was the last major train station to be constructed in Vienna, and its existence was predominantly driven by the economic desire to create strong trade connections with Berlin and northern ports. While passenger traffic was ended after 1959, the station continued as an active national and international freight traffic transfer point. It was closed in 2016. Although the station was one of the longestlived logistical points near the inner city, its existence was always questioned, even since its construction, partly due to its proximity to the even larger Nordbahnhof. The quality of life for residents of the area has historically been notably affected by noise and air pollution, and warehouses and transport vehicles became dominant elements of the landscape.²⁷ The character of the Nordwestbahnhof was not only simply industrial, however. The main station building

²⁴ "Die Geschichte von Wien-Brigittenau" <u>https://www.stadt-wien.at/wien/wiener-bezirke/die-geschichte-von-wien-brigittenau.html</u> (22.11.2023).

²⁵ "Brigittakirche" <u>https://www.geschichtewiki.wien.gv.at/Brigittakirche</u> (22.11.2023)

²⁶ "Die Geschichte von Wien-Brigittenau" <u>https://www.stadt-wien.at/wien/wiener-bezirke/die-geschichte-von-wien-brigittenau.html</u> (22.11.2023).

²⁷ Hachleitner, Bernhard,/ Hieslmair, Michael,/ Zinganel, Michael: Blinder Fleck Nordwestbahnhof Biographie eines innenstadtnahen Bahnhofsareals. Wien 2022.

for passenger traffic was considered a prominent and prestigious project. Wilhelm Bäumer from Stuttgart was chosen as the architect in 1869.29 Airy steel structures typical of the era's train stations are integrated into solid structures reminiscent of Italian renaissance architecture, creating an atmosphere with decidedly grand and industrial character. (See Fig. 09) The entrance was also directly across from the baroque Augarten's entrance, which would have enhanced the station's presence of stateliness and significance in a developing area not far from the city center. The early life of the Nordwestbahnhof in the late 1800s could be regarded as its highpoint. Not only were the exhibits for the World Exhibition in Vienna delivered here, but many significant goods were brought into the city in this station, such as Bohemian industrial ceramics, dairy products, fish from Hamburg's Nordsee company, and agricultural products distributed by the Spar company.²⁸

In the 1930s, the station building was used as an event space for National Socialist propaganda.²⁹ In 1938, a speech of the Führer regarding the annexation of Austria into the German Reich was broadcast from the building.³⁰ This event engulfed not only the hall of the station, but also the surrounding landscape, in the party's presence and order. In the same year, the large antisemitic exhibition "Der ewige Jude" was also displayed in the train station hall. (See Fig. 10) Prior to 1938, roughly 20 percent of the residents of Brigittenau were Jewish. Today,



Fig. 10, "Der ewige Jude" exhibition; Foto: TimTom/ L.Hilzensauer, Wien Museum

more than 160 names of Jewish residents are commemorated in memory plaques in this district, and the "Weg der Errinerung" also runs through it.³¹ Most of the deportations of the more than 45.000 Jewish people took place from the Aspangbahnhof, but after 1943, these shifted to the Nordbahnhof, neighbour of the Nordwestbahnof.³² According to Michael Zinganel, a curator, artist, and cultural scientist in Vienna, the Nordwestbahnhof benefited from the fact that its connecting bridge had survived the war, while that of the Nordbahnhof had not; under the occupying Russian power, these rails saw a

²⁸ Hachleitner, Bernhard,/ Zinganel, Michael,/ Stuiber, Peter "Annäherungen an den Nordwestbahnhof, Von der Zuckerrübe zur Russenschleife" in Wien Museum Magazin. 2023. <u>https://magazin.wienmuseum.at/annaeherungen-anden-nordwestbahnhof</u> (13.12.2023).

²⁹ Hachleitner, Bernhard,/ Hieslmair, Michael,/ Zinganel, Michael: Blinder Fleck Nordwestbahnhof Biographie eines innenstadtnahen Bahnhofsareals. Wien 2022.

³⁰ Jary, Rudolf: "Vergangenheit und Gegenwart des Wiener Nordwetbahnofes" in Verkehrswirtschaftliche Rundschau. Vienna 1938; p. 13-15. ÖBB Archiv, Wien.

³¹ "Steine der Erinnerung" <u>https://steinedererinnerung.net/projekte-2/20-bezirk/</u> (22.11.2023).

³² "Der Nordbahnhof war der direkte link zwischen Wien und Auschwitz" Österreichische Akademie der Wissenschaften. 2020. <u>https://www.oeaw.ac.at/news/der-nordbahnhof-war-der-direkte-link-zwischen-wien-und-auschwitz</u> (13.12.2023).

lot of transport, both passengers and cargo, after 1945, and it was the most important supply station for the Soviets. With new connections during this time, trade also flourished with the Middle East. Until the late 20th century, the station remained a highly used and important trade point.³⁰ Passenger traffic from the Nordwestbahnhof was ended in 1959, when the Praterstern station was opened.³³ When the station was rebuilt after the war, it received a functional modern look. With the addition of the DB Schenker warehouses from 1963 to 1964, the Nordwestbahnhof became Austria's largest contiguous forwarding facility, with a total of 40.000 square meters. With 200 to 250 employees, the station remained DB Schenker's most important Austrian location into the mid-1990s.34

1.1.2 Conclusions | History

For nearly four hundred years, despite dramatic shifts in its boundaries due to alterations to the Danube's flow, the Brigittenau district has been formally anchored by elements which exist out of the show of gratitude (the Brigittekapelle) and those which tell a story of giving space which, as its formal Baroque language communicates, once showed power and control, to the public (the Augarten). It was, as well, an area that welcomed every member of the population (as during the Brigittakirtag festivities), to the extent that physical bridges needed to be built to support this public use and allow citizens to come together. It also long remained a place where nature maintained a relatively strong presence, both as a hunting garden and as an active floodplain, until industrial development reshaped the land in the mid-1800s. The case can then be made that giving space which

represents the power of industry over the area back to the residents and back to nature would be continuing a use pattern that has distinguished it for centuries. The neighbourhood of the project site lost a significant proportion of its residents in the second world war. If the site, central in an area with many Jewish residents, could become a place that serves as a living green urban core to support new life and in turn the new residents who will shape a diversifying city, bringing a community together, some positive gesture could be made in memory of the irreparable damage that was inflicted.

Given the history of the station and the Danube in terms of traffic and economics, the area has long been one of international coming and going, for people as well as for goods. This reinforces its current social landscape, which, as discussed in chapter 1.2, is one experiencing greater change and diversification than many others in the city, as a social landscape of international movement.

³³ "Geschichte des Wiener Nordwestbahnhofs, Die" ORF. 2019. <u>https://oe1.orf.at/artikel/657092/Die-Geschichte-des-Wiener-Nordwestbahnhofs</u> (13.12.2023).

³⁴ Hachleitner, Bernhard,/ Hieslmair, Michael,/ Zinganel, Michael: Blinder Fleck Nordwestbahnhof Biographie eines innenstadtnahen Bahnhofsareals. Wien 2022.

1.2 Social and Economical Profile of the Brigittenau District

Industry and Economy

Along with the 1875 Danube Regulation, wharfs that could accommodate newer technologies, such as the steamship, were constructed, and handling equipment, silos, and freight sheds began to claim the connected land.³⁵ The dominating infrastructure of the Brigittenau district still gives the area a strongly industrial feel in many locations. The economical history of the city overall has substantial roots in industry; in the 1910 census, for instance, about half of all Vienna's workers were in either manufacturing or industry; the settlement of larger companies in districts that grew out of the late 19th century period of industrialisation, such as those in the Brigittenau district, enabled Vienna to profit from a larger factory infrastructure.36

Today, a large majority of the 29.034 Brigittenau employees work in services such as finance and consultation (21%), trade (16%), and public administration (15%), as well as education, traffic, health, and IT, with only ten percent employed in industry and construction. Most of these workers, 24.216 people, live in other districts and commute to the Brigittenau for work. 32.958 Brigittenau residents work in other districts, with only 4.818 being employed in the Brigittenau itself.³⁷ Nearly 60 percent of the residents are working age, between 25 to 64.³⁸

Current and Future Population

Particularly due to international immigration, the city of Vienna has grown significantly over the past six decades to reach its current population of 1.982.097 in 2023, and it continues to grow at a high rate. In 2023, 32,4 percent reflects the amount of foreign nationals in the city. This percentage is higher in the Brigittenau district, at 54,2 in the same year, making it the district with the second highest percentage of foreign nationals in its population.³⁹ While the city is predicted to age, with the anticipation of more moderate immigration rates in the coming decades and a lower than historical birthrate, it is still expected to reach a size of roughly 2,2 million by 2048 with a strong working population (though also with higher demands for care for the elderly).40

The Brigittenau district is one of the most significantly changing, with a projected growth of 18 percent by the year 2038; it's also the smallest and most central district to be experiencing such a rise in population. (See Fig. 13) The district has a population of about 84.471. Already in 2022, the Brigittenau district was one of the more densely populated, with 14.792 people per km²

³⁵ "History" Hafen Wien. <u>https://www.hafen-wien.com/en/company/history</u> (13.12.2023).

³⁶ Weigl, Andreas: "Ein wichtiger Industriestandort – Wien vor dem Ersten Weltkrieg" Schloß Schönbrunn Kultur- und Betriebsges.m.b.H., Wien. 2023. <u>https://ww1.habsburger.net/de/kapitel/ein-wichtiger-industriestandort-wien-vor-dem-ersten-weltkrieg</u> (13.12.2023).

³⁷ Bauer, Ramon,/ Fendt, Christian,/ Lukacsy, Michaela,/ et al.: "Die Brigittenau in Zahlen—Statistiken" Landesstatistik Wien (MA 23). Vienna. 2022. <u>https://www.wien.gv.at/statistik/pdf/bezirke-in-zahlen-20.pdf</u> (27.11.2023).

³⁸ Bauer, Ramon,/ Himpele, Klemens: "Auf dem Weg zurück zur Zwei-Millionen-Stadt—die Entwicklung der Wiener Bevölkerung" Stadt Wien. 2019. <u>https://wien1x1.at/bev-entwicklung-3/</u> (27.11.2023).

³⁹ Imorde, Markus: "Vienna's population 2023—facts and figures on migration and integration" Stadt Wien—Integration und Diversität, MA 17. 2023. <u>https://www.wien.gv.at/english/social/integration/facts-figures/population-migration.html</u> (27.11.2023).

⁴⁰ Bauer, Ramon,/ Himpele, Klemens: "Auf dem Weg zurück zur Zwei-Millionen-Stadt—die Entwicklung der Wiener Bevölkerung" Stadt Wien. 2019. <u>https://wien1x1.at/bev-entwicklung-3/</u> (27.11.2023).

compared the city's average of 4.656 people per km². Foreign nationals come predominantly from Serbia, Turkey, Romania, Poland, and Germany. 4,8% of the city's students live in the district, and approximately 23 percent of residents have completed a university level education.⁴¹

About 16.000 new residents will be housed in the development for the former Nordwestbahnhof area, which is anticipated to be completed by the year 2035;⁴² 5.000 jobs will be created through this project as well.⁴³ The development would also bring four new education facilities to the district, and it will contribute more affordable housing, with 60 percent of the new apartments being subsidised.⁴⁴

1.2.1 *Conclusions* | Social and Economical Profile of the Brigittenau District

Overall, Vienna is a growing city with a diversifying population. One of the centers of this growth is the district of the project site. The district is one where many people come and go, with workers predominantly coming from other areas of the city and residents mostly commuting elsewhere for work. As



Fig. 11, Brigittenau jobs





discussed in chapter 1.1, the district lacks a historic centre such as a market area or main plaza, and observation concludes that no real social core of the area is present, with the most active areas being loosely distributed along busier, commercial streets. It could be argued, based on analysis in chapter 1.1, that

⁴¹ Gumpoldsberger, Christine,/ Bartos-Stock, Elisabeth,/ Berchtold, Peter Friederich,/ et al.: "First Vienna Residential Market Report 2023" BUWOG Group GmbH. Vienna. 2023. <u>https://publikationen.ehl.at/view/1054053969/58/</u> (27.11.2023).

⁴² "Stadtentwicklungsgebiet Nordwestbahnhof" Stadt Wien. <u>https://www.wien.gv.at/stadtplanung/nordwestbahnhof#</u> (10.12.2023).

⁴³ "Übereinkommen zwischen Stadt Wien und ÖBB bringt am Nordwestbahnhof 10 Hektar Grünraum, 5.000 Arbeitsplätze, 6.500 Wohnungen uvm." Presse-Service Rathauskorrespondenz. <u>https://presse.wien.gv.at/2020/08/18/</u> <u>uebereinkommen-zwischen-stadt-wien-und-oebb-bringt-am-nordwestbahnhof-10-hektar-gruenraum-5-000arbeitsplaetze-6-500-wohnungen-uvm</u> (13.12.2023).

⁴⁴ "Nordwestbahnhof" <u>https://www.wien.gv.at/stadtentwicklung/projekte/pdf/nordwestbahnhof-english.pdf</u> (13.12.2023).

Bevölkerungsveränderung in den 23 Wiener Gemeindebezirken Prognose 2018 bis 2038

Veränderung in Prozent



Fig. 13, Vienna Population Growth Projections by District



Fig. 14, Chart: City of Vienna—Integration & Diversity



Fig. 15, average age in the Brigittenau district

the Nordwestbahnhof in its original form was a kind of central, grand, orientating element in the landscape, afforded particular prominence by its proximity to the well established and culturally valuable Augarten. A new public open space in this area should therefore place importance on community, offering a space that can grow and change to meet the character of its changing population. With its central location, the project site would be easily accessible to a large percentage of the Brigittenau residents, so its role as an identity-shaping open space could be significant. Moreover, given the existing Kindergartens in the immediate proximity of the project site, as well as those educational institutions planned to be contributed to the district by the development of the Nordwestbahnhof, the new open space should be oriented to support families by offering interactive play areas and, significantly, by creating safe connections free from traffic between schools, residences, and existing parks. Observation of use of the district's open spaces and interaction with its residents, in addition to the above described statistics, support the design of a public open space that can be enjoyable for young families as well as offer more restful oases that enhance pedestrian connections and provide visual screening between more established residential areas and offices, commercial uses, or highways.



Fig. 16, Urban Heat Vulnerability Map of Vienna, Austria, 2019; project site area within pink border area

1.3 Climate Change Impacts in Vienna

Among the greatest threats posed by climate change in Vienna is the increase in temperature levels and the associated health risks posed to residents. Densification significantly accelerates the Urban Heat Island (UHI) effect and negatively impacts urban climate overall, due to higher percentages of sealed surfaces, structures' materiality, and altered wind flow; Vienna is one of Europe's most quickly growing metropolitan areas, expecting to see a population increase of 300,000 by 2048, and with a desire to minimize expansion, the city will be facing significant densification in the next decades.⁴⁵ Vienna's currently high proportion of publicly accessible green spaces, 31 percent (including 73 percent forested areas and 6 percent that can be categorised as public park space), are substantial contributors to the high quality of life the city supports.⁴⁶ For this reason, developing new strategies to maintain that quality of life and a comfortable urban climate as densification occurs is essential.

High temperatures pose significant health risks, and with UHI, denser urban areas become particularly vulnerable. Worldwide in 2003, over 70,000 deaths were attributable to a major heatwave, and in the summer of 2022, Europe's hottest recorded season, over 60,000

⁴⁵ Loibl, Wolfgang,/ Vuckovic, Milena,/ Etminan, Ghazal,/ et al.: "Effects of Densification on Urban Microclimate—A Case Study for the City of Vienna" in: Atmosphere. Issue 12(4)/2021; p. 511. <u>https://doi.org/10.3390/atmos12040511</u> (20.11.2023)

⁴⁶ "Öffentlich zugängliche Grünflächen—Analyse" <u>https://www.wien.gv.at/umweltschutz/umweltgut/oeffentlich.html</u> (20.11.2023)



31 30

29

28

27 26

20

19

18 17

16 15

> 01:00 03:00 05:00

00:70

11:00

0 [°C]

Fig. 17, number of hot days in Vienna, 1955-2020

2018

Department – Municipal Department 22,

© Vienna Environmental Protection

Innere Stadt

Nordbahnhof

Seibersdorf



up to 25 days compared to the reference simulation (1971-2000). For the period 2071-2100 a strong increase is expected ranging from about 20 to 50 additional summer days per year."⁴⁹

Comparison of the hourly temperature distribution in areas within the city center, including the Nordbahnhof area of the project, against those in more rural areas, 00:71

demonstrates the higher heat levels corresponding to the greatest density. (See Fig. 18) The location of the project's site in Brigittenau has been analysed to have an Urban Heat Vulnerability Index (UHVI) rating of 0.6 to 0.8, making it a more highly impacted area concerning heat risks within the greater Vienna area. (See Fig. 16) In consideration of the plans for development in the area, more densification will mean an accelerated UHI and more need for mitigating strategies.

Fig. 18, Average Hourly Temperature Distribution, Summer 2012

⁴⁷ Ballester, Joan,/ Quijal-Zamorano, Marcos,/ Fernando Méndez Turrubiates, Raúl,/ et al.: "Heat-related Mortality in Europe during the Summer of 2022" in: Nature Medicine. Issue 29/2023; p. 1857-1866. <u>https://doi.org/10.1038/s41591-023-02419-z</u> (20.11.2023).

⁴⁸ "Urban Heat Islands and Heat Mortality" <u>https://stories.ecmwf.int/urban-heat-islands-and-heat-mortality/index.html</u> (20.11.2023).

⁴⁹ Zuvela-Aloise, Maja: "Future of Climate Urban Heat Stress Impacts—Adaption and Mitigation of the Climate Impact on Urban Heat Stress based on Model Runs Derived with an Urban climate Model" Vienna 2013. <u>https://</u> www.klimafonds.gv.at/wp-content/uploads/sites/16/03032015FOCUSZuvela-AloiseEBACRP2B060373.pdf (20.11.2023)



The airway of the Danube provides regional cooling from winds originating, for instance, in the alpine foothills to the southeast, and this has significant positive effects for the city during hotter summer days. Local wind channels coming from nearby landscape areas such as the Wiener Wald also provide significant cooling and fresh air exchange to the dense, central areas.⁵⁰ As illustrated in the city's 2020 climate analysis map (See Fig. 19), the Brigittenau district benefits directly from the river airway (hatched area with eastern border meeting the line of the project site) and minimally from the local cool air channels (crosshatched areas). Most of the district is depicted as experiencing moderate to strong overheating (yellow and red).

1.3.1 Conclusions | Climate Change Impacts

Given the threats to health and quality of life posed by climate change and the need for densification, it is necessary to develop strategies to mitigate risks such as increased

project site area in marked green border area

heat in quickly growing city landscapes. The proportion of beneficial green spaces in the city surfaces may often be threatened by densification. Maximising the potential of these green spaces in terms of both their direct effects on the daily quality of life of users in regards to increased urban heat, mainly the provision of shaded and cooler, vegetated areas, as well as in terms of the longer term urban cooling and clean air supported by an actively thriving ecosystem within the urban environment, should be a central task for any new landscape design. With its rapid growth and high value on quality of life, Vienna serves as an ideal model for developing strategies that could be applied elsewhere.

⁵⁰ "Wiener Stadtklimaanalyse" MA18—Stadtentwicklung und Stadtplanung. <u>https://storymaps.arcgis.com/stories/</u> <u>134065bbccdf4e5c8d2aa6f9cade8297</u> (10.12.2023).



Fig. 20, connection between divided green spaces around Friedrich-Engels-Platz

1.4 Landscape of the Brigittenau District, Overview of the Project Site



Millennium Tower is a prominent landmark from 1997 which can be seen from many locations throughout the district as well as from the project site. (See Fig. 21) Many of the residential complexes are comprised of six to seven story buildings. In the southern area, used car lots are abundant and also directly border the project site, as does a large Bauhaus market. Infrastructure for vehicles is particularly dominant in this district. Streets like Jägerstraße (a historical line of connection through the area referencing the layout of the 1600s) and Dresdner Straße run roughly parallel to the project site; the latter supports tram lines as well as four car lanes. The northernmost sections of the site





Fig. 21, Millennium Tower seen from the project site

Fig. 22, Nußdorfer Schleusenbrücke

are neighboured by a juncture of highways, and the noise pollution from the traffic in this area is significant.

Mobility

The Brigittenau district is well connected with public transit. In addition to the central U6 underground line and multiple tram lines which create direct connections to the city center, suburban trains and even some



Fig. 23, Public Transit in the Brigittenau District Vienna

ViennaGIS

⁵¹ Bauer, Ramon,/ Fendt, Christian,/ Lukacsy, Michaela,/ et al.: "Die Brigittenau in Zahlen—Statistiken" Landesstatistik Wien (MA 23). Vienna. 2022. <u>https://www.wien.gv.at/statistik/pdf/bezirke-in-zahlen-20.pdf</u> (27.11.2023).

regional trains are also reachable from the Handelskai and Traisengasse stations. The northern area of the district is well served by several bus lines. (See Fig. 23) Along with the development of the former Nordwestbahnhof site, more public transportation lines will also be added to the area.⁵² Travelling by bicycle through the district is made possible by ample bike lanes along roads, and bike path connections along the Danube and the Danube Canal also serve the area and create links to other parts of the city. (See Fig. 27) Still, many streets throughout the district are heavily dominated by vehicle traffic and not as welcoming to cyclists.

Public Open Spaces

Currently, 28 public green spaces can be counted in the Brigittenau district, which, according to calculations by the author that were compared to several online resources, together make a total of nearly 45 hectares.⁵³ ⁵⁴ This includes the roughly 99.000 m² of the Donaukanal in the Brigittenauer Lände (predominantly a pathway running alongside the canal), the 22.400 m² Am Brigittenauer



Fig. 24, Figure Ground Plan

Fig. 25, Brigittenauer Public Green Spaces

⁵² STADTRAUM Nordwestbahnhof. Exhibition. MA 21 Stadtplanung, Stadt Wien. Nordwestbahnstraße 16, 1200 Wien. Visited 12.2023.

⁵³ Bauer, Ramon,/ Fendt, Christian,/ Lukacsy, Michaela,/ et al.: "Die Brigittenau in Zahlen—Statistiken" Landesstatistik Wien (MA 23). Vienna. 2022. <u>https://www.wien.gv.at/statistik/pdf/bezirke-in-zahlen-20.pdf</u> (27.11.2023).

⁵⁴ "Brigittenau" <u>https://en.wikipedia.org/wiki/Brigittenau</u> (10.12.2023).





Sporn (an area that is not easily reachable, separated by the Nußdorfer Schleusenbrücke (See Fig. 22) and multiple highway overpasses at the northernmost tip of the land from the main district area), and the over 130.000 m² Handelskai Promenade (an exposed, straight strip along the Danube serving cyclists with a paved bike path).

These numbers mean that in the city's twentieth district, there are about 5,3 m² per resident of public green space as of the time of this analysis in 2023. The World Health Organization recommends 9 m² per person of green space.⁵⁵ The new development of the Nordwestbahnof will be adding about 10 hectares of public open space to the district, as well as roughly 16.000 new residents.⁵⁶

Calculations including the new residences and green spaces of the development as well as the approximately 34.950 m² of the project site as public green space would change the district's ratio to about 5,8 m² of public green space per resident. While this is not a substantial gain, and the public open space added by the Nordwestbahnhof makes up about 74 percent of it, the rail segment would have the significant benefit of being easily accessible to a larger proportion of the community given its linear layout and length exceeding a kilometre through the district.

⁵⁵ Russo, Alessio,/ Cirella, Giuseppe T.: "Modern Compact Cities: How Much Greenery Do We Need?" In: International Journal of Environmental Research and Public Health. Issue 15/2018; p. 2180. <u>10.3390/ijerph15102180</u> (10.12.2023).

⁵⁶ "Stadtentwicklungsgebiet Nordwestbahnhof" Stadt Wien. <u>https://www.wien.gv.at/stadtplanung/nordwestbahnhof#</u> (10.12.2023).



Fig. 27, Brigittenau with site location; street sections locations (see also Fig. 26); locations of notable landscape elements



Fig. 28, diagrammatic plan, project site

1.4.1 Overview of the Project Site

For purposes of organising the analysis process, the project site, roughly 1,3 kilometres in length, will be referenced in five segments distinguished by the author. (See Fig. 28) The endpoints of these sections have been set by the locations of bridges. The site has an approximate overall area of roughly 34.950 m², or about 3,5 ha. With the exception of area A, only two tracks can be found throughout most of the site. Each bridge is approximately 4,7 meters wide between railings. For graphic representations of the following discussed context points in the landscape, refer to Fig. 27.



Fig. 29, area A



Fig. 30, bridge between C and D looking north

Area A is the widest segment, up to 25 meters across on the level area. There are two to four rail tracks, with more splitting and converging than in other areas, as it is closest to the former train station. There is also a substantial shoulder with larger amounts of grass and other vegetation where an older track once was. (See Fig. 29) The bridge over Hellwagstraße marks the southern end of the project site and is the direct connection point to the planned development on the former Nordwestbahnhof site Along the east side of area A are seven story residential buildings with the buffer zone of a green space and walkway in the upper part and small private lots in the lower. The west side has more small lots and a large gravel lot which has some maintenance and construction vehicles and activity.

Area B is an isolated area of the site. Along the west side are parking lots, a large Bauhaus store with a storage area open to the site, and an Aldi with parking on its roof at about the

same level as the site. This commercial border lends some character to the site, but the west side is more striking: here, large empty lots are the direct neighbours after a larger consulting firm's office building and a small used car sales company at the southern end. A gasoline station and a small auto service building enclose the area on the far side bordering Dresdner Straße. Presumably these lots will be home to new uses in the future. Given this, area B has some of the least certain context and could benefit from a flexible plan that allows it to be altered as the character of its immediate surroundings distinguishes itself more with time and potential user groups are formed. Area B is about 12m wide, with 4m between the two rails.

Area C is the only area to be bordered directly by a major park space, the Forsthauspark. The park, which is discussed in more detail in the first section of this chapter, is not the only element of historical landscape significance in this area. Running along the west side is a portion of Jägerstraße, whose layout references the hunter's way in the hunting park life of the district in the 17th century. The lower west side is commercial: used cars and storage border the site with parking lots and single-story buildings. On the north west side is a residential building, this one with a Kindergarten on the ground floor which would have direct access to the site. A pedestrian and bike pathway runs along the entire east side, connecting to Forsthauspark. The AUVA insurance company building on the south east corner has a very strong visual presence. (See Fig. 27, 30)

Area D is dominated by its residential neighbours. On the east side, a small strip of garden plots with sheds border the full length of the site. Close behind these are residential buildings, which have direct visual access to the site. Along the west northern portion, a sports center is the neighbour, and playing courts are a buffer to the highway traffic. While the highways are not so visually intrusive in this area, the traffic noise is already very present, particularly in the northern half.

Area E is unique in its character. Here, the rails descend to the ground level and split. (See Fig. 33) They both terminate under the elevated highways of the major juncture point.



Fig. 31, area D looking north



Fig. 32, bike path connection at Schongauergasse



Fig. 33, area E, north and south rails after split

Traffic is very present in this area through its noise. As addressed in more depth in chapter 1.5, the vegetation in Area E is guite different to that of the other areas, with many more trees being able to grow and with a moister ground promoting different species that prefer riparian environments. On the east side of the site, the landscape is more open, with residential complexes being separated some distance by a larger area of small private lots. To the north and west, the highways impose on the space of the site and eventually bridge it where the rails terminate. At this point, active railways separate the site from the Handelskai Promenade. Small green space areas with bike paths are interwoven in the highway landscape. The most direct access point to these is from the southern endpoint of area E, specifically from Schongauergasse, which leads into the residential area. (See Fig. 32) This area is mostly inactive at the street level, though it does have one central Kindergarten, which could enjoy easy access to the project site. Area E therefore has potential to directly serve the larger community surrounding it.

1.4.2 Future Open Spaces

The development of the Nordwestbahnhof site is an important transformation of the project site's context. The site directly links the green space of this development to the Donaukanal. The area is planned to include a "Grüne Mitte," a central open space area. The former rail segment that is the site of this project is intended as a "Highline-Park" for pedestrians and cyclists.⁵⁷ No concrete plans for this have been made, however. The general erasure of Vienna's industrial history as old sites are redeveloped is a critical point of discussion among professionals in city planning and related fields; the city's favouring of temporary solutions when it comes to new design types, instead of greater initiative to integrate these permanently into regulations, is also an aspect of its planning practices that receives significant critique.58 According to plans and visualisations, the Nordwesthbahnhof area will be treated largely as a blank slate for a completely new design. Public information does note that some industrial remnants of the former station will be integrated into the new development.⁵⁹ Still, this is an area which could arguably receive more attention in the city, particularly given the significance industry has historically played in the lives of many of the Viennese people. While green dominates plans shared with the public and biodiversity always receives ample mention, visualisations depict a fairly traditional open space with predominantly recreational green areas. (See Fig. 34) While some plans do emphasise areas set aside to more natural landscape forms, such as the "natural groves" and "natural meadows" described in a plan of the mixture of green space forms, the biodiversity supported by the Grüne Mitte will almost certainly not fulfil to the same extent the habitat of the brownfield area it replaces, since these former industrial landscapes are among the richest habits, and last refuges, for many wild pollinators in the city.60

⁵⁷ "Stadtentwicklungsgebiet Nordwestbahnhof" Stadt Wien. <u>https://www.wien.gv.at/stadtplanung/nordwestbahnhof#</u> (10.12.2023).

⁵⁸ Urban Future Talk 08: Das (un-)sichtbare Gedächtnis der Stadt, Spurensuche in der Stadtentwicklung. Public Event. Moderated by Johannes Lutter, Abteilungsleiter Stadtentwicklung & Mobilität, UIV Urban Innovation Vienna. 29.11.2023. Nordwestbahnstraße 16, 1200 Wien.

⁵⁹ STADTRAUM Nordwestbahnhof. Exhibition. MA 21 Stadtplanung, Stadt Wien. Nordwestbahnstraße 16, 1200 Wien. Visited 12.2023.

⁶⁰ Zettel, Herbert,/ Ockermüller, Esther,/ Schoder, Sabine,/ et al.: "Kommentierte Liste der aus Wien (Österreich) nachgewiesenen Bienenarten (Hymenoptera: Apidae)" in: Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen. Issue 74/2022. p. 71-126. <u>http://www.entomologie.at/uploads/www.entomologie.at/</u><u>zettel_et_al_2022_ZAOEE_74.pdf</u> (07.12.2023).

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Overall, the strengthening of a green network for the district is emphasised, of which the project site could be an important connecting piece. In an urban planning report, the city outlines its goals for the future profile of Vienna as it undergoes significant development in order to meet the demands of a diversely growing population and increasingly dramatic climatic changes. Emphasis is strongly placed on maintaining, and increasing, the high quality of life the Austrian capital provides, which the report owes largely to the supply of accessible green spaces as well as to affordability in costs of living. In the report, attention is given to the fact that preserving, or even enhancing open space quality alongside the process of densification is a great challenge, and the need to place adequate importance on maximising each open space's contribution to the urban life is critical. Explicit interest in the implementation and further exploration of the urban wilderness and nature-inspired landscape spaces, which can be high in quality yet lower in cost, is expressed. This form of

Fig. 34, Die "Grüne Mitte"

design is described as "still unusual," with the desire placed to have its character and purpose further understood. The report emphasises the high importance of improving street design, especially in situations where this can be done alongside street construction and maintenance, calling also for the "conversion, reuse and redesign of streetscapes," with the goal for enhancement of public space through additions and installations without the impediment of movement. The city wishes to evolve "strategies and instruments of urban development so that they not only help to maintain the levels of quality attained, but also allow for new, future-oriented qualities;... systematically conditioning the city's built stock, (open) spaces and ecological status so as to allow high-quality growth that preserves what is valuable, renews what is obsolete and transforms the outdated;"61

⁶¹ "STEP 2025 Urban Development Plan Vienna" Municipal Department 18 (MA 18)—Urban Development and Planning. Vienna City Administration. Vienna 2014. <u>https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008379b.pdf</u> (25.11.2023).

1.5 Biodiversity in the Urban Landscape

Existing Biodiversity in the Context Area

Currently, the site's direct context area does not support a high degree of biodiversity. Most of the public green spaces in the district have regularly maintained grass lawns, and only a small percentage of them have more than four species of trees. While the city claims to be very supportive of wild foragers, observation of the vegetation diversity in larger areas, such as the Brigittenau district, reveals that much could still be improved for wild pollinators. Among the most prevalent tree species in the project site's surrounding area are: Acer, Betula, Fagus, Forsythia, Ginkgo, Pinus, Prunus, Sambucus, and Syringa.

The Danube

Vienna's Donauinsel is a major recreational area for the city, but it also supports notable biodiversity in flora and fauna. While the vegetation in some areas precedes the regulation of the Danube, such as Toter Grund and Zinkerbachl, where old poplar stands can be found, other biotopes are also new and created by humans.⁶² Many wild pollinators thrive on the island: about 20 percent of Austria's native bee species can be found there. A June 2022 report on wild bees on the island evaluated 23 locations for the presence of different species and the supporting habitats. In the areas closest to the project site, comprised mostly of cherry tree groves and meadows, 15 to 18 species were observed, most of which were polylectic, or pollen generalists; this trend was similar on the island overall, with only a small percentage of oligolectic bees (specialists depending on certain types of pollen). In an area with a sown meadow and overgrown embankments, nearly half of the observed species were specialists. Overall, due to the variety in microclimates, the diversity of flora with varied blooming seasons, and the good networks of shorter distances between nesting and foraging areas, the Donauinsel is a good habitat for many wild bee species.⁶³

1.5.1 Vegetation on the Project Site

55 plant species have been tentatively identified on the project site.^{64 65 66 67 68} (See Fig. 36) While the information is limited and incomplete, it still provides useful insight into the nature of the site. The present species are indicative of a disturbed landscape, common in such areas as the site's abandoned rails. In area E, the northernmost section of the site, a much different composition of vegetation was observed as in the rest of the site. The species in area E would suggest a moister ground, given that many of these species are either highly tolerant to or thrive in wetter conditions, riparian landscapes, or areas prone to flooding; many of these species, such as the Buddleja davidii, are not present elsewhere along the site where the tracks are raised. While brambles (Rubus caesius)

⁶² "Danube Island" <u>https://www.wien.gv.at/english/environment/waterbodies/danube-island/</u> (08.12.2023).

⁶³ Pachinger, Bärbel,/ Rotteneder, Magdalena,/ Kerschbaumer, Judit,/ et al: "Endbericht: Entwicklung und Evaluierung von Maßnahmen zur Förderung von Wildbienen auf der Donauinsel" Universität für Bodenkultur Wien. Vienna 2022. <u>https://www.wien.gv.at/umwelt/gewaesser/donauinsel/dicca/pdf/endbericht-wildbienen.pdf</u> (07.12.2023).

⁶⁴ Royal Horticultural Society <u>https://www.rhs.org.uk/plants</u> (04.12.2023)

⁶⁵ FloraVeg.EU – Database of European Vegetation, Habitats and Flora. 2023. <u>https://floraveg.eu/taxon/</u> (04.12.2023)

⁶⁶ World Flora Online. <u>https://www.worldfloraonline.org/</u> (04.12.2023)

⁶⁷ Pl@ntNet <u>https://identify.plantnet.org/</u> (03.12.2023)

⁶⁸ Missouri Botanical Garden <u>https://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx</u> (03.12.2023)



Acer campestre present: areas D, E prefers moist, welldrained, acidic soils



Acer saccharum present: areas A, B prefers moist and welldrained, does not thrive in poorly drained soil



Berteroa incana present: areas A, B, C thrives on disturbed ground, poor soil conditions



Chelidonium majus present: area A prefers moist and welldrained soil



Equisetum ramosissimum present: all areas prefers poorly-drained soils, also grassy areas



Acer cappadocicum present: areas A, B prefers moist, welldrained, acidic soils



Aethusa cynapium present: areas Å, B, C thrives in disturbed area and roadsides



Betula pendula present: areas B, C, E prefers well-drained, moist soil, tolerates waterlogging, pollution



Clematis vitalba present: all areas associated with more disturbed areas; likes well drained soil



Falcaria vulgaris present: areas A, B, C, D prefers well-drained soil, rocky areas, and disturbed areas



Acer platanoides present: area E prefers moist, welldrained soils, tolerant of heat, draught, soil range



Ageratina riparia present: area E thrives in damp areas and disturbed sites



Betula pubescens present: areas C, E prefers well-drained, moist soil, tolerates wet, poor, and acidic soils



Cornus sanguinea tolerates wide soil type range, prefers moist and well-drained soil



Fraxinus excelsior present: area A prefers moist, welldrained loamy soil



Acer pseudoplatanus Acer opalus present: area A likes well drained, can tolerate poor soil, does well in heavy clay soils



Ailanthus altissima present: all areas tolerates dry to wet soil, low to high pH, drought, and flooding



Boehmeria cylindrica present: mostly area A moist soil, shade



Echium vulgare present: areas B, E (most) present: areas A, B, C, D prefers dry to moist, welldrained soil, drought tolerant



Fraxinus ornus present: area B prefers well-drained, moist, loamy soil, tolerates some draught



present: area E prefers moist soil, can tolerate nutrient poor soils



Bassia scoparia present: mostly area A thin top soil, harsh soil conditions, draught tolerant, disturbed sites



Buddleja davidii present: area E invades disturbed sites and riparian areas



Erigeron canadensis present: area B prefers light to medium soil types and tolerates dry conditions



Hedera helix present: area A prefers well-drained alkaline soil, tolerates a wide range of soils



Juglans regia present: area A prefers well-drained and loamy soils



Parthenocissus tricuspidata 'Veitchii' present: area A try to medium welldrained soils



Prunus avium present: area D prefers fertile, moist, well-drained soils



Ligustrum vulgare present: area A likes loam, sand, and clay; well-drained soils



Paulownia tomentosa present: area E (one) tolerant of many conditions, likes damp areas, invades disturbed areas



Prunus cerasifera present: area A prefers well-drained, . moist soil



Lonicera nigra present: area E prefers moist, welldrained soil, tolerates a wide range of soils



Pilosella officinarum present: area B tolerates depleted soils, poor drainage, and draught



Prunus mahaleb present: area E thrives in poor, rocky, but well-drained soils



Melilotus officinalis present: areas A, B tolerates high alkaline soil, thrives in rich and clay loam soils



Populus alba prefers consistently moist prefers well-drained soils, tolerates draught once established



Prunus padus present: area B likes moist soil and tolerates a wide range of soil types



Parthenocissus inserta present: area A tolerant of a wide range of soil types



Populus x canadensis present: areas B, E (many)present: all areas (E many) moist soil, disklikes dry soil; sandy to clay tolerant



Prunus x fruticans present: area B prefers lighter, moist, well-drained soil

dominate most of the ground in areas C, D, and E (being more minimally present in the southern sections, where a greater diversity of smaller plants can be found), area E is still rich in a variety of tree and shrub types. Some of these, such as the Betula, Populus, Salix, and Robinia, could be beneficial to the creation of a green space that could support more diverse fauna. These are common pioneer trees, often the first to grow in disturbed areas because they regenerate easily, are quick growers, and are fairly tolerant of less than optimal growing conditions.⁶⁹ Their presence can begin to transform the nature of the open space, creating the beginnings of new

habitats that are more hospitable to less hardy species. These species can also be highly valuable for biodiversity. Salix caprea, for instance, is a willow with the rare ability to thrive in gravelly, clear cut areas and does not need a riparian environment to survive; its flowers serve as one of the year's first major



project site

⁶⁹ Rothkegel, Wolfram,/ Ruppert, Ottmar,/ Klemmt, Hans-Joachim,/ et al.: "Underestimated pioneers" Bayerische Landesanstalt für Wald und Forstwirtschaft. 2022. https://www.waldwissen.net/en/forestry/silviculture/forestregeneration/underestimated-pioneers (07.12.2023).



Reseda phyteuma present: areas A, B, C tolerates wide a wide soil range, often found in wastelands



Salix caprea present: area E likes moist, welldrained soils; dislikes shallow chalky soil



Sonchus oleraceus present: area A, B, C prefers moist, welldrained soils, disturbed roadside areas



Robinia pseudoacacia Rosa dumalis present: areas A, B, E prefers rich, loamy, moist, tolerates a wide range of well-drained soils



present: area B tolerates wide soil range, tolerates a wide soil prefers moist soil



Syringa vulgaris present: area A prefers neutral to alkaline, moist, welldrained soils



present: areas B, E well-drained soils



present: area E range, likes medium to wet, well-drained



Ulmus pumila present: area A prefers well-drained soil, withstands draught and poor soil well



Rubus caesius Salix alba present: all areas (sparce present: area E (one A) in A, B, dense in C, D, E) likes moisture-rich soils, tolerates a wide soil range tolerates poorly drained



Senecio inaequidens present: areas Å, B, C thrives in disturbed areas, like rocky landscapes



Verbascum virgatum present: areas A, B prefers well-drained and dryer soil, thrives in disturbed ground



Setaria viridis present: all areas tolerates moist to dry soil types



Viburnum lantana present: area E prefers moist, welldrained soils but dry tolerant; disturbed areas

Fig. 36, vegetation on the project site

foraging sources for bees, and it feeds caterpillars of 37 butterfly and moth species. In total, about 500 insect species depend on willows. About 30 bird species are also known to use willow pollen as a particularly proteinrich food source (among these are Parus caeruleus (blue tits), Sylvia (warblers), and Phylloscopus (leaf warblers). Dryobates minor, the lesser spotted woodpecker, is among the birds that thrive on decaying pioneer tree species.⁷⁰ Other species present in the area, such as the Buddleja davidii, are detrimental

to biodiversity. The buddleia, an invader of riparian areas and disturbed sites, which is quite prevalent in area E, does provide nectar for butterflies, but it is not an adequate food source for their larvae, and it pushes out other species.71

The fungus Cristulariella depraedans might be present on some maple trees. Usually, the tree recovers in a year and the lower branches are mostly affected. Cooler, wetter summers are associated with the disease.72

⁷⁰ Schmidt, Olaf: "Pioneer tree species: ecologically valuable" Bayerische Landesanstalt für Wald und Forstwirtschaft. 2020. https://www.waldwissen.net/en/forest-ecology/forest-plants/deciduous/valuable-pioneer-trees (07.12.2023).

⁷¹ "butterflybush Buddleja davidii" Invasive Plant Atlas of the United States. https://www.invasiveplantatlas.org/ subject.html?sub=11608#:~:text=Ecological%20Threat,a%20negative%20impact%20on%20wildlife. (05.12.2023)

⁷² "Cristulariella depraedans" <u>https://en.wikipedia.org/wiki/Cristulariella_depraedans</u> (07.12.2023).
Vegetation in Rail Tracks

Overall, the high tolerance of or preference for alkaline soils of many present species might suggest a soil with a higher pH level throughout the project site area, but given the amount of information, this conclusion is still quite speculative. The soil types used for the subgrade of the rail track-the level supporting the subballast (a well draining crushed stone layer) and above it the ballast (the top layer of large crushed stones directly supporting the rail)-vary greatly and sometimes even include a degree of former construction, but course grained soils tend to be preferred for their durable support.73 (See Fig. 37) Generally, vegetation takes over more guickly outside of the rails directly, because the ballast bed is hot, dry, and designed to drain water out efficiently. Because of this drainage system, water tends to pool on the borders of track areas, making these areas hospitable to many species and sometimes transforming them into wetland-like habitats.74 Eventually, ballast stones are worn down and more fine material accumulates. An increase in finer material then makes it possible for more moisture to be retained and for more plants to take root in this ground. Fine material from the sub-layers starts moving upwards as well into the ballast over time, weakening the

support for the rail but allowing more vegetation to thrive. While this process demonstrates the importance of keeping plants out of tracks for the maintenance of active railways, it illustrates how vegetation works in tandem with the gradual breaking down of ballast, subballast, and substrate materials to transform former tracks into places that can support more growth.⁷⁵

That larger species such as Betula pendula, Populus canadensis, and Robinia pseudoacacia have been observed growing directly between or next to the tracks themselves could be a good indication that the ballast level has already become broken down to some degree and currently includes a significant amount of finer material. The presence of moisture-loving species in and between the tracks in areas A, B, C, and D, most notably the prevalent Equisetum ramosissimum, could also be explained if the composition of the ballast layer has already changed significantly enough that a greater percentage of finer material allows for much higher water retention.



Fig. 37, Cross-section of a Typical Railway Track

⁷³ Li, Dingqing,/ Hyslip, James,/ Sussmann, Ted,/ et al.: "Substrate" in Railway Geotechnics. Routledge Handbooks Online. CRC Press. Boca Raton 2015. <u>https://www.routledgehandbooks.com/doi/10.1201/b18982-4</u> (07.12.2023).

⁷⁴ "Railway ecology" <u>https://en.wikipedia.org/wiki/Railroad_ecology</u> (07.12.2023).

⁷⁵ "UIC 'Vegetation Control' Project" International Union of Railways. 2003. <u>https://uic.org/IMG/pdf/uic_alternative_vegetation_control_022303-uic-project-2003.pdf</u> (07.12.2023).

1.5.2 Wild Pollinators in the Urban Context

Protecting biodiversity is essential to the health of ecosystems and the planet as a whole.⁷⁶ Despite progress in policy and planning changes, effective progress in terms of protecting biodiversity is still overall inadequate.77 Wild pollinators are globally facing decline, and while the drivers are many and complex, human activity is largely responsible. In Europe, the most certain and impactful threats include configuration and management of land, pesticide use, and climate change.⁷⁸ Habit fragmentation is a term frequently used to describe the division of habitats due to humans' reconfiguration of the land.⁷⁹ The extent to which the breaking up of habitats and isolation of individuals negatively effects the pollinator network is complex and not completely understood, though it is well accepted to be a primary threat to biodiversity and a healthy ecosystem in general.⁸⁰ Habitat loss has been shown to

have a particularly strong negative impact on native bee species.⁸¹ In addition to habitat fragmentation and pesticide use, loss of wild flora also makes rural land less hospitable to native pollinator species; increased beekeeping of domestic bee species is also a threat to less robust wild species.⁸²

While human activity and the expansion of the built environment have unquestionable negative impacts on natural ecosystems and biodiversity, it does not follow that the city landscapes we now have established and continue to expand must be inhospitable to threatened species. In some studies, cities have been shown to support an even greater richness of biodiversity than rural areas.⁸³ In fact, "cities are perceived as shelters for pollinators because of low pesticide exposure and high floral diversity throughout the year."⁸⁴ York University's Sheila Colla, an expert in pollinator conservation and environmental policy, explains that,

⁷⁸ Dick, Lynn V.,/ Breeze, Tom D.,/ Ngo, Hien T.,/ et al.: "A global-scale expert assessment of the drivers and risks associated with pollinator decline" in Nature Ecology and Evolution. Issue 5/2021; p. 1453-1461. <u>https://doi.org/10.1038/s41559-021-01534-9</u> (21.11.2023).

⁷⁹ Xiao, Yian,/ Lie, Xiaohong,/ Cao, Yusong,/ et al.: "The diverse effects of habitat fragmentation on plant-pollinator interactions" in Plant Ecology. Issue 217/2016; p. 857-868. <u>https://doi.org/10.1007/s11258-016-0608-7</u> (21.11.2023).

⁸⁰ Grass, Ingo,/ Jauker, Birgit,/ Steffan-Dewenter, Ingolf,/ et al.: "Past and potential future effects of habitat fragmentation on structure and stability of plant-pollinator and host-parasitoid networks" in: Nature Ecology and Evolution. Issue 2/2018; p.1408-1417. <u>https://doi.org/10.1038/s41559-018-0631-2</u> (21.11.2023).

⁸¹ Steffan-Dewenter, Ingolf,/ Potts, Simon G.,/ Packer, Laurence: "Pollinator diversity and crop pollination services are at risk" in: TRENDS in Ecology and Evolution. Volume 20, Issue 12/2005. p. 651-652. <u>https://www.yorku.ca/bugsrus/</u>resources/publications/2005%20Steffan-Dewenter,%20Potts%20and%20Packer.pdf (21.11.2023).

⁷⁶ Hooper, D. U.,/ Chapin, F. S.,/ Ewel, J. J.,/ Hector, A.,/ et al.: "Effects of Biodiversity on Ecosystem Functioning: A Consensus of Current Knowledge" in Ecological Monographs. Volume 75, Issue 1/2005; p. 3-35. <u>https://doi.org/10.1890/04-0922</u> (21.11.2023).

⁷⁷ Díaz, Sandra. M.,/ Settele, Josef,/ Brondízio, Eduardo,/ et al.: The global assessment report on biodiversity and ecosystem services: Summary for policy makers. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) 2019; p. 34. <u>https://ri.conicet.gov.ar/handle/11336/116171</u> (21.20.2023).

⁸² Ropars, Lise,/ Dajoz, Isabelle,/ Fontaine, Colin,/ et al.: "Wild pollinator activity negatively related to honey bee colony densities in urban context" in: PLOS ONE. Issue 14/2019. <u>https://doi.org/10.1371/journal.pone.0222316</u> (21.11.2023).

⁸³ Ives, Christopher,/ Lentini, Pia,/ Threlfall, Caragh,/ et al.: "Cities are Hotspots for Threatened Species" in: Global Ecology and Biogeography. Volume 25, Issue 1/2016; p. 117-126. <u>https://doi.org/10.1111/geb.12404</u> (20.11.2023).

⁸⁴ Ropars, Lise,/ Dajoz, Isabelle,/ Fontaine, Colin,/ et al.: "Wild pollinator activity negatively related to honey bee colony densities in urban context" in: PLOS ONE. Issue 14/2019. <u>https://doi.org/10.1371/journal.pone.0222316</u> (21.11.2023).

"especially with climate change, if we want to have resilient ecosystems, resilient cities, we need to have as many species of bees as possible in our cities."85 Bringing wild pollinators into urban landscapes is therefore not only possible, but also likely one of the most effective ways to support these species and prevent further decline. Offering the proper support for desired species is critical and effective; according to researchers at the University of Helsinki, pollinators will come to areas within a city if the right plants are provided, so creating new habitats even in more central, densely built areas has potential for the strengthening of biodiversity.86 Brownfield areas, in particular, provide valuable habitats for bees, and this regardless of scale—small sites make as good habitats as larger ones.87

The city of Berlin is an example of a dense urban landscape in which many wild bee species have been able to thrive. Half of all of Germany's bee species are present in the capital city.⁸⁸ Specifically, 320 species have been documented, including several threatened species which cannot survive without highly specific pollen types. Not only planting the necessary vegetation to support the wild pollinators, but also providing artificial nesting structures and improving the availability of natural nesting possibilities has been essential towards making this a reality in Berlin. As of 2022, the city's landscape includes 71 sites with ideal living conditions for wild bees, and Christian Schmid-Egger of the "Berlin blüht auf" project has expressed intentions to expand these habitats into parks as well as smaller areas such as roadway medians.⁸⁹

Planting the needed vegetation and maximising the blooming times throughout the year are major parts of successfully creating habitats for wild bees. Providing suitable nesting areas to meet the varied needs of different species is also critical. Some methods shown to be effective include: stone piles and drystone walls for nesting;⁹⁰ allowing some earth to remain uncovered;⁹¹ and promoting more natural cycles in the environment by, for instance, allowing dead wood to decompose and thereby fostering more diverse flora.⁹²

⁸⁵ Chiu, Allyson: "The Unexpected Downside of Raising Bees in your Backyard" in The Washington Post. 2023. <u>https://</u> www.washingtonpost.com/climate-solutions/2023/05/19/urban-beekeeping-save-wild-bees/ (20.11.2023).

⁸⁶ "Alusta pavilion – Environmentally conscious architecture" <u>https://www.aalto.fi/en/events/alusta-pavilion-</u> <u>environmentally-conscious-architecture</u> (20.11.2023).

⁸⁷ Huttunen, Johanna: "Bumblebee diversity in urban brownfields as affected by local and landscape characteristics" University of Helsinki. 2022. <u>http://hdl.handle.net/10138/345802</u> (22.11.2023)

⁸⁸ Memmott, Jane: "The conservation, restoration and utilization of pollinators" The Urban Pollinators Project. University of Bristol. <u>https://www.parliament.uk/globalassets/documents/post/Urban---H-of-Parliment-MEMMMOTT-2.pdf</u> (07.12.2023).

⁸⁹ "Bienenprojekt: Blühflächen helfen bei Artenschutz in Berlin" Berlin.de Das offizielle Hauptstadtportal. 2022. <u>https://</u> www.berlin.de/aktuelles/7378421-958090-bienenprojekt-bluehflaechen-helfen-bei-a.html (07.12.2023).

⁹⁰ "Wild bees on the Danube Island" <u>https://www.wien.gv.at/english/environment/waterbodies/danube-island/dicca/</u> <u>measures/wild-bees.html</u> (07.12.2023).

⁹¹ "Wildbienen—Vielfalt durch den passenden Lebensraum" <u>https://www.wien.gv.at/umweltschutz/naturschutz/biotop/</u> wildbienen.html (07.12.2023).

⁹² "Alusta pavilion – Environmentally conscious architecture" <u>https://www.aalto.fi/en/events/alusta-pavilion-</u> <u>environmentally-conscious-architecture</u> (20.11.2023).

Creating sufficient networks is also important. The individual foraging patterns of different species varies, but the areas they cover are generally not extremely large. "Nesting pollinators travel relatively short distances from the nest to forage: most species of bee are known to travel less than two kilometres away."93

Wild Pollinators in Lower Austria

Within Europe, Lower Austria is home to both a rich variety of wild pollinators and a relatively large number of threatened species. (See Fig. 38, 39) This would make the Austrian capital, an urban landscape currently undergoing transformation and densification, a valuable area for the support of native species. Vienna is home to around 500 types of wild bee species,94 at least six of

which were recently thought to be extinct in Austria (including Anthophora plagiata, Colletes punctatus, Hylaeus crassanus, Nomada mauritanica, N. melathoracica and N. tridentirostris).95



Fig. 38, Species Richness of European Bees

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Fig. 39, Distribution of Threatened Bees in Europe

A 2022 study identifying wild bee species present in Vienna revealed a large number of strong populations of different bees, but note of the extra need to mitigate the negative effects of densification the city will be

⁹³ Rands, Sean A.,/ Whitney, Heather M.: "Field margins, foraging distances and their impacts on nesting pollinator success" in: PLoS One. 2011. https://pubmed.ncbi.nlm.nih.gov/21991390/ (06.10.2023).

⁹⁴ "Wildbienen—Vielfalt durch den passenden Lebensraum" https://www.wien.gv.at/umweltschutz/naturschutz/biotop/ wildbienen.html (07.12.2023).

⁹⁵ Zettel, Herbert,/ Ockermüller, Esther,/ Schoder, Sabine,/ et al.: "Kommentierte Liste der aus Wien (Österreich) nachgewiesenen Bienenarten (Hymenoptera: Apidae)" in: Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen. Issue 74/2022. p. 71-126. <u>http://www.entomologie.at/uploads/www.entomologie.at/</u> zettel_et_al_2022_ZAOEE_74.pdf (07.12.2023).

experiencing was also made. The Nordbahnhof site, an area similar to and near the project site and the Nordwestbahnhof, was particularly mentioned as a valuable brownfield area whose development will be a notable loss for pollinators. As agriculture makes increasingly less land available to wild species, the potential value of cities to support these species was also emphasised, to which end not only pollen and nectar sources but also nesting habitats must be provided.¹⁰⁷

1.5.3 Precedent Studies — Biodiversity in Cities and Former Railway Sites

Many projects are concerned with the question of biodiversity in cities, often also in relation to sites that have former industrial uses. The comparison of these projects to the site in Vienna's Brigittenau is an insightful tool for understanding the likely limitations and potentials in redesigning the former rail segment connecting the Donaukanal to a major new development. The list of studied existing projects is extensive, and of these the most pertinent are presented here.

Park am Gleisdreieck

Berlin, Germany; 2013 Atelier Loidl Landschaftsarchitekten⁹⁶

Berlin's Park am Gleisdreieck is interlaced with stretches of abandoned train rails and effectively utilises this existing element to organize the new layout. Of the park's 31,5 hectares,⁹⁷ approximately just under a third are reserved as protected urban wilderness.



Fig. 40, Rail Path in Park am Gleisdreieck, Berlin

These areas are broken between functional areas for recreational use, a strategy which allows users proximity to areas they should not enter and ample space for activities, so both nature and humans are served. Simple design strategies, such as using certain rails as designated pathways and providing informative and friendly signage, are successful in communicating to users which areas they should respect from outside and which they can use. While the scale of the park is much larger than that of this project, the applicable question of how to allow access to areas primarily serving biodiversity is effectively addressed through the patchwork alteration of usable and non-usable space.

⁹⁶ "Gleisdreieck Westpark, Berlin" https://atelier-loidl.de/de/gleisdreieck-westpark-berlin (21.11.2023).

⁹⁷ "Park am Gleis Dreieck." <u>https://de.wikipedia.org/wiki/Park_am_Gleisdreieck</u> (21.11.2023).

Particularly because much of the vegetation in the protected areas seeded itself, this element of the park provides useful insight into patterns of growth in an area with a similar former use as a railway. An on-site overview of some of the most prevalent species revealed that birches, poplars, maples, locust, and elms were all trees common to the park. (See Fig. 41) Species tended to be grouped together.

According to information provided by Grün Berlin Gmbh, grasses and weeds were the first species to populate the abandoned area after use as an active train station ended in 1980. Pioneer plants, light-loving trees and shrubs, followed and transformed the open spaces into wooded areas. To these species belong the birches, poplars, and locusts. In succession, more demanding species such as oaks, elms, and linden could grow given the shade provided by the pioneers. A phenomenon not uncommon in Berlin's Brachen, many of the park's species are originally from other parts of the world—many from Asia, some from North America and Africa—and have independently assimilated and thrived in the climate and soil. A rich diversity of fauna is also supported by the self formed wilderness.⁹⁸

Despite its differences in scale, climate, and preexisting vegetation conditions, Park am Gleisdreieck offers relevant insight into the potential benefits of working with self-seeded, already present plants when strengthening biodiversity is a goal in the transformation of a formerly industrial urban site into a public green space.



Fig. 41, vegetation documented by author in Park am Gleisdreieck, Berlin; from left to right by row from top: Acer saccharum; Ailanthus altissima; Betula pendula; Betula pubescens; Clematis sp.; Clematis vitalba; Cornus sanguinea; Elaeagnus angustifolia; Populus x canadensis; Robinia pseudoacacia.; Robinia viscosa; Sambucus canadensis; Senecio inaequidens; Syringa reticulata; Ulmus laevis

⁹⁸ On-site signage, Park am Gleisdreieck, Berlin. Provided by Grün Berlin GmbH. 2023.

Alusta Pavilion, Helsinki Helsinki, Finland; 2023 Suomi/Koivisto Arkkitehti⁹⁹

The Alusta Pavilion aimed to create an area within the city that human and non-human animals can share in the small space of a former parking lot. It explored possibilities for supporting greater biodiversity in urban contexts. Diverse pollinators were offered spaces to live within clay structures, fired and unfired brick, wood, and rammed earth walls.¹¹¹ On the recommendation of ecologists, elements such as logs with fungi were also included so that nature's processes of decay and growth could be allowed to complete the design process.¹⁰⁰ The pavilion was temporary, so plants will be relocated and all building materials will be reused elsewhere or recycled. The space also served as an educational and interactive platform by allowing visitors to participate in shaping it and attend events on subjects such as the importance of soil and cycles in building material use.¹⁰¹ While the differences between the Alusta Pavilion and the project site are great in terms of duration of the project and scale, the temporary design by Maiju Suomi and Elina Koivisto showcases a variety of implemented methods and supporting research to meet the shared goal of designing open spaces in cities which serve not only humans or non-human animals, but which bring them together, simultaneously supporting social needs and a healthier urban environment and demonstrating that these need not be addressed separately.



Fig. 42, Alusta Pavilion, Helsinki; photos by author, 2024

⁹⁹ "Alusta pavilion" https://www.met-a.fi/copy-of-projektit-suomenlinna-1 (20.11.2023)

¹⁰⁰ "Alusta pavilion – Environmentally conscious architecture" <u>https://www.aalto.fi/en/events/alusta-pavilion-environmentally-conscious-architecture</u> (20.11.2023).

¹⁰¹ "Museum Yard in 2023: Alusta Pavilion" <u>https://www.designmuseum.fi/en/alusta-pavilion/</u> (20.11.2023).

1.5.4 Supported Wildlife

The aim of the vegetation strategy is to create habitats for a diversity of native animal life on the site. Nesting and foraging opportunities are created for wild pollinators, and the flora supports a range of small mammals, reptiles, amphibians, birds, and insects. The following depict a representative sampling of species which could potentially be found on the fully developed new site. The selected species are either rare and most likely to be given a home on the site, particularly linked to the Danube floodplain landscape and found in the Donau-Auen National Park, and/or have been highlighted as the country's animals of the year.¹⁰² ¹⁰³

Anthophora plagiata: the rare polylectic (a generalist, collecting pollen form various flower kinds) wild bee was thought to have been extinct in the Vienna region, but in 2022 it was recorded again in the area; the bee nests in self-dug cavities in steep ground.

Carduelis carduelis: nests high in treetops in sparser tree stands; often found in residential areas with less maintenance; feeds on seeds; difficulty finding wild plants for food in over-maintained urban areas.

Cyanistes caeruleus: prefers deciduous and mixed forests and can be found in parks and gardens; nests in tree holes, will accept nesting boxes; diet consists of insects, seeds, fruit, and nectar.

Erinaceus europeus: nests in leaf heaps and wood piles in winter; inhabits structurally rich landscapes with ample hedges for hiding; can be found in parks and gardens.

Garrulus glandarius: inhabits parks and gardens as well as its natural deciduous forest home; can be found in all of Lower Austria; wide-ranging diet.

Glis glis: prefers oak and beech dominated forests, can be found in urban margins; its habitat is often cut by development, and it would particularly benefit from stronger urban green networks.

Limenitis populi: lives in damp areas; feeds on aspen and black poplar trees, making it a likely resident in the project site.

Micromys minutus: found in the Danube floodplain landscape; inhabits areas with higher vegetation such as reed beds, as well as grain fields.

Muscardinus avellanarius: inhabits species-rich undergrowth in mixed and deciduous forests; eats flowers, buds, insects, berries, and seeds.

Nymphalis antiopa: inhabits moist, bright forested areas as well as orchards and avenues; the caterpillars feed predominantly on birch and willow, while adults prefer fallen fruit.

Osmia papaveris: threatened with extinction; solitary; nests in self-dug cavities and lines its nests with poppy flower petals.

Phengaris teleius: rare in Europe and found only locally in Lower Austria; prefers wet meadows rich in flowers as well as streams and ditches; found particularly with knapweed (*Sanguisorba*), its nearly exclusive food source.

Phosphaenus hemipterus: one of the area's three firefly species; it makes its home in the edges of forests, floodplain landscapes, and in meadows, and it can be found in parks and gardens.

Picus viridis: prefers forest edges, sparse forests, and the edges of orchards, but can be found in parks and gardens as well; old trees and dead wood are required for its burrowing.

Rhinolophus hipposideros: hunts insects close to the ground in forests; inhabits semi-open landscapes and water edge areas; can be found in development border areas.

Serinus serinus: numbers are quickly dropping due to loss of vital brownfield areas; feeds exclusively on wild herbs and some tree seeds, such as birch and elm; prefers low vegetation, some trees, and open landscapes; can be found in urban landscapes.

¹⁰² "Tiere in Niederösterreich" <u>https://www.naturland-noe.at/tiere</u> (20.07.2024).

¹⁰³ Nationalpark Donau Auen <u>https://www.donauauen.at/wissen/natur-wissenschaft/die-donau</u> (18.07.2024).

1.5.5 *Conclusions* | Landscape of the Brigittenau District and Biodiversity in the Urban Landscapes

The abandoned rail segment is currently a central line of division through the Brigittenau district, but this was the case even in its earliest days when its barrier-like presence hindered residential development in the late 1800s.¹⁰⁴ A successful design for the site would change the tracks from a dividing element in the district's landscapes into a connecting one.

Given its proximity to large developments, its centrality within a changing neighbourhood, and its character as a former industrial element with the freer quality afforded by the state of abandonment, the project site has the high potential to serve its context area and enhance quality of life as an accessible green space, a corridor connection between green spaces, and a valuable testing ground for the inclusion of new green space types, such as the urban wilderness, in the city of Vienna.

Fragmentation of habitat is one of the most significant threats against biodiversity and endangered species, so recreating stronger networks to support the lives of species displaced by human development is an area in which landscape architecture could play an effective role. Strong evidence supports the high potential of city landscapes to become good homes for wild pollinators. Given the richness of native species in the region including Lower Austria, alongside the dangers of extinction faced by many, the city of Vienna has the strong potential to help stop the decrease of these species by creating support networks as it expands and transforms.

While Vienna has taken some good measures to support wild pollinators in its urban landscape, there is still large room for improvement, particularly in areas such as the Brigittenau district, whose green spaces are on average fairly low in terms of biodiversity and therefore poor supporters of wild bee species, whose needs are very specific both in terms of food and habitat. Considering both existing and planned public open spaces, the Brigittenau district offers a good amount of usable open space for a variety of recreational functions. Therefore, the need to promote species diversity should take precedence over the need for more recreational open spaces. Given its central location and potential to connect to areas of greater species richness, namely that of the Donauinsel, the project site would be not only suitable, but ideal as an area to be partially dedicated to protecting urban biodiversity as the core of a stronger nature network.

Cities are here to stay, and densification is an unavoidable transformation for many urban areas now and in the future. It then becomes necessary to integrate nature back into our built landscapes. A project in a central, developing area in the growing city of Vienna has great potential to explore ways in which open spaces might be designed to better serve all species, human and non-human, and to explore new perspectives of built landscapes as spaces to live with, not separate from, a rich and thriving nature.

¹⁰⁴ Hachleitner, Bernhard,/ Hieslmair, Michael,/ Zinganel, Michael: Blinder Fleck Nordwestbahnhof Biographie eines innenstadtnahen Bahnhofsareals. Wien 2022.



Fig. 43, view of the wet woodland interactive nature area on a firefly evening

2 | DESIGN

Hypothesis, Concept and Design Strategies, Project Details

2.1 Hypothesis

The full potential of the Brigittenau district's former railway segment can only be realised if a currently divisive element of the landscape is transformed into one which creates connections, and the new design provides functionally for both urban and wild users and acts as a fluid core throughout the context area in both ecological and social terms, strengthening networks and provoking the expansion of engaging, and ecologically effective, green space in the district and the city of Vienna.

Socially, the design must be accessible to all and built for users of all ages and backgrounds, reflecting the diversity of the growing Brigittenau district. Ecologically, it must address rising heat levels and serve the community as a green oasis and as functioning lungs of the city, whose urban wilderness areas act as a catalyst for the expansion of this green space typology within the city of Vienna; it must provide habitat for the wild fauna displaced by development and loss of valuable brownfield areas. These goals can only be achieved if the design sparks engagement and becomes a valued and representative core of the district, which can best be accomplished if historical aspects are respected, accentuated, and built upon-both culturally, the industrial past, as well as ecologically, regarding the floodplain landscape—while the changing future needs of the district are simultaneously addressed. The design must be rooted in history as well as in its response to the demands of the future, anchored decisively in specific place while fluidly open to, and a catalyst of, future transformation.

2.2 Concept | In the Auen, Forms of the Landscape

The landscape of the city of Vienna, and most pronouncedly its twentieth district between the Danube and the canal, is a composition resulting from a balancing of two forces: the river, and the the human inhabitants. Struggles between floods and regulation attempts have shaped the urban layout over centuries. Today, the meandering arms of the Danube through its floodplains are formally constrained, and much of the biodiversity in this notably rich landscape has been severely negatively effected through regulation of the river, development, and pollution. The land of the Brigittenau district remained as an ecologically rich floodplain for a relatively longer time, being developed first industrially and partially, and then undergoing more dramatic change to its overall structure only with the regulation of the river in the 1870s. The characteristics of the floodplain-its vegetation, its flowing and transforming nature, and its fluid form -are therefore still defining qualities of the Brigittenau (whose name reflects both this landscape type as well as the saint after whom its historic chapel was named). The second most distinctly defining element of specific place is the more recent industrial history, which began as the area on the city's outskirts was suitable for the placement of factories, and expanded with the Danube's regulation and the addition of the Nordwestbahnhof, both of which developments instigated significant increases in the district's economy because of the direct trade connections created in its landscape.



Fig. 44, concept diagram

These two historical characteristics—the floodplain landscape and the flourishing industry rooted in the landscape—are drawn upon as the basis for the design of the green space which is to replace the former railway terminating in the Nordwestbahnhof.

The highest priority of the design is to build and enhance connections: connections for people throughout the city, connections for wildlife with the urban environment, connections between past and present, connections between the members of the community, and not least, connections between the human users and the natural landscape.

Because both railways and rivers support connection, the conceptual application of these place specific elements of the Brigittenau creates an effective framework on which to build a spatial language that supports these goals. Fluidity, function, and transformation are qualities anchored in these ideas which can most specifically describe the application of the concept of flow and connection:

Like the efficient railway system, the new green space's ecological, social, and circulatory systems must also be highly functional within a limited, narrow space. To do this, the design draws formally upon the landscape of the Au, the expanding, branching, soft curves of the interconnected waterways' flows and the islands formed in between. In application, the flow can be read as unbroken boardwalk element which unites every changing segment of the site as it responds to highly varied contexts. It is also the basis for the structural approach to the ecological element of the design, which is conceived as the heart of its identity, both for wild animal users as much as for the quality of nature and oasis it brings to the human community. Specifically, the intention is to create a system as unbroken as possible to allow wild users as much fluid connection and movement throughout the urban landscape as can be provided. Where streets necessarily break the flow, one of two former railway bridges is at least left to be lightly vegetated and provide access for animals.



Fig. 45, isometric view of the site with major context connections

Like the river body, the flow of the design sometimes physically breaks down the dry land. In carefully identified locations where such openings in the mound of the former railway would be most beneficial, and arguably necessary for the enhancement of a strongly connected community as well as for the support of an interconnected habitat infrastructure, the existing landscape is more dramatically deconstructed.

Beginning from the northern end at the Danube, more historic rail structures are preserved, and the quality of the vegetation retains the urban wilderness character of the untouched Brachen, or brownfield area to the greatest degree. As the flow continues southwards into the urban centre of the Brigittenau, the old industrial structure of the rails are increasingly deconstructed as the needs for human users must be given more square metres



Fig. 46, diagrammatic plan, project site

and the integration of wilderness and usable space becomes highly integrated.

Intertwining the two user groups' spaces with as much balance as possible, yet without losing engagement between them, also relies spatially on the concept of flow. In segments where more space is devoted to wildlife habitat, based on context conditions, human users are given islands within the flow, points of access differentiated by topographical changes where they can step off the boardwalk and enjoy moments of nature.

Finally, the body of the river in the floodplain changes its course over time, altering the form of the landscape along with it. The design for this site is intended as a starting point for the fluid expansion of more interconnected urban wilderness and usable green spaces within the immediate district, and more broadly as a typology within the greater area of the city of Vienna.

In its direct context, it achieves this through the proposal of temporary urban wilderness take-overs of adjacent vacant lots, with the hope of permanent transformation in that direction, as well as the flexibility at its borders to be evolved and expanded into areas currently paved for parking or commercial buildings' service zones.

Some existing, mostly city-owned green spaces could already be planted with diverse wild flowering species in order to support pollinators in a connected urban network, of which the new design of the railway site could function as a foraging core with ample nesting places. Alternatively, should more construction fill vacant lots and paved areas, the site is still intended to function independently as an oasis running through the dense urban fabric, its vegetation and spatial choreography shielding users from the more chaotic context environment.

2.3 Organisation of Uses, Design Overview

Analysis of the site's context area closely determines the designed nature of each segment of the former railway. Refer to Fig. 47 for a graphic representation of the areas' contexts and characteristics discussed below. For segment identification, refer to Fig. 46.



Fig. 47, context mapping; response of site character based on conditions in the surrounding area

2.3.1 Defining Dominant Uses

The northernmost areas, **segments E and D**, are dominated by heavy traffic pollution, making them less suitable for use as green space to stop, rest, and play. For wild users however, these areas are optimally situated nearest to the river and the more biodiverse Danube Island—a benefit for flying species and pollinators with a wide enough foraging range—and are least disturbed by humans and pets.

Tightly enclosed between residences, private gardens, and the backside of sports facilities, the second to northernmost segment is also ill-suited for extended human use, and it serves mainly as a connecting element with some restful seating spot options. (See fig. 57, 59) Both of these segments are therefore intended predominantly for wild users. The urban wilderness character is most pronounced here. Travelling south, **segment C** has the most set context in terms of existing development. Between park, residences, and kindergartens, this segment is ideal as a human user dominant zone. In response to the context, this segment is the most extensively designed. Both its new built elements, as well as its more extensive working of the topography and its choice of pine-dominant vegetation, make the linearity and geometry of this area stand out from the others and bind it to its historic neighbours.

Segment B is the most highly open to future transformation and the most currently chaotic in context. Bordered by vacant lots, car sales and repair lots, some offices, the commercial loading areas, and shopping buildings and their parking lots (from the rooftop parking of Hofer one stands level with the railway), this area prioritises wild habitat as the dominant spatial use, capitalising also on the topographical low point and adjacent



impermeable surfaces to construct a rainwater retention based wet woodland.

Segment A, the southernmost portion, is surrounded by an area urban and active in character, and it responds by acting as a green space predominantly intended to serve the human community. Still, the concept of this segment as an individual park, and as the summation of the entire project site as its urban core, is the engagement and merging of human and wild users.

The broader area of this segment allows for more opportunities to integrate ecologically rich areas alongside those accessible to humans, and it is the goal of the design in this segment to maximise that opportunity, accentuating interaction and closeness with nature as its defining quality.



Fig. 48, detail plan of the main entrance area, woodland paths, and rainwater retention area



Fig. 49, Section GG, rainwater retention, Core One, and the graffiti wall near the main entrance



Fig. 50, view of the urban core recycled concrete seating area with neighbouring residences and the graffiti wall

2.3.2 The Three Cores

Three cores of the site anchor the design and reflect its central aims, each featuring a circular design element of varied character to emphasise the unique qualities of its context and linked designed area. Each core circle articulates the priority of heightening engagement and connection with nature in the urban landscape through a different approach. The formal language of each reflects these ideas and supports different kinds of engagement from the human users, whether through observation, through contemplation and atmosphere, or through direct physical immersion and play.

Core One | Urban

This active area features the main entrance and connects directly to happening areas, and the planned mixed-use development at the former Nordwestbahnhof, as well as to nearby transportation or foot connection to the city center. Here, an active urban park is created, but an integration of the urban and wild user spaces is also brought to culmination at this place of engagement. The circular element of the urban core is a seating and gathering area made of recycled concrete. The intended atmosphere here is a playful one, and this entire portion of the site is centered around active, physical engagement with the varied natural areas, around play, and around learning.

The design features strips of paved areas with regular widths but varied heights as playful climbing elements. (See fig. 49, 50) They merge like spread fingers into the landscape, embracing the vegetation to grow between them as the design of the site overall aims to find space for growth within the highly built landscape, even if the space is small. This element is about merging and coming together, about the interplay between nature and the built world. The paved surfaces could be useful for small events and simply for seating. This element is also a marker against which natural change can be made legible: as plants grow, seasons shift, or water collects in this somewhat lower point of the upper topography section, the differences will be easy to see in contrast to this familiar and unchanging concrete feature.

More circular elements continue the motif and encourage play throughout this area. Steppingstone-like elements of varied heights in recycled concrete similarly offer and invite access to selected portions of wetland landscapes or as parts of natural play areas (discussed in Ch. 2.6.4). Meandering pathways wind through wooded areas, hiding and revealing views to expand the spatial Forest quality within a limited space and offer many restful and quiet areas to sit. Small bridges are playful ways to cross the wettest portions of the landscape.

Overall, the topography here is altered significantly. A crumbling retaining wall is removed, and what was a steep difference of levels is softened into a gentle slope which connects the upper areas to the southwest corner with a welcoming spatial gesture. This corner becomes the main entrance point. (Reuse of the wall is covered in Ch. 2.6.3.) Towards the center of the segment, an opening is made under a bridge, which affords direct connection at the lower level between the residences on both sides.

Core Two I The Stump: Residential, Community The Stump is a built element which effectively serves to emphasise place and history, to create connections, and to afford spiritual, restful connection to the atmosphere of forest.

Conceptually, the Stump is highly representative of the project's intent overall: to connect people with each other, to connect people with nature, and to promote the acceptance of natural growth and decay cycles as something beautiful and healthy



Fig. 51, the Stump concept of natural cycles

within the green spaces of our urban landscapes. (See fig. 51, 54) The Stump, and this segment of the site overall, is more extensively designed to reflect the character of the context area, whose development is more stable and features the most historically significant structures. The circular form acts as an element which brings people together while offering a spatial anchor. It responds to and accentuates the presence of the historic Brigittakapelle on the other side of the Forsthauspark, which provides play areas, space for dogs, and a skate park. It accomplishes this not only through a proposed linking path in the existing park between the chapel and new seating feature, but also through the formal design: the circularity and finished quality of the Stump make it an abstraction of the octagonal chapel, a second, now nature oriented, circular and significant point



Fig. 52, view of the Stump seating area from the Forsthauspark in Winter



Fig. 53, Section CC, movement through the Stump and under the bridge with Kindergarten at right

within the landscape. This is a point of dialogue between past and present, the new respecting and highlighting the old as a balanced line of counterpoint.

Rammed earth walls of varied heights, whose benches are topped with wood, compose the Stump. Users can gather in the more exposed areas on the open benches near the Forsthauspark and bike path, or they can find a sheltered, quiet corner between or behind the walls, among the trees. The Stump could support a child's birthday party as well as it could accommodate a solitary reader enjoying the forest atmosphere or a family's evening picnic, and with its varied layout, many users can enjoy the place differently at once. The topography in this location is also more extensively altered. The movement of the two raised areas as they reach the opening at the Stump is shaped as an embrace around the gathering and clearing point, evoking the transitions of forest characters throughout broader landscapes. The opening between them, built around the desired physical connections between park and residential area and adjacent Kindergarten, is choreographed so that as one travels under the bridge from one side to the other of the site, the path raises and lowers gently and topography and built elements partially conceal and reveal visual connections from one area to the next. (See fig. 52, 53, 55) The combined movement of the topography around the circle help to direct movement here not just

along the linear length of the former railway, but outward as well into the existing urban fabric. The vegetation here is dominated by pine trees. This decision is based on multiple needs of the location. Tall buildings in multiple places, such as the massive insurance office tower at one end and the residential building at the other, tightly squeeze the site; tall, evergreen trees provide visual privacy for both park users as well as those in the buildings all year long. (See fig. 56) The horizontally dominant linearity of the built elements, the Stump and the footbridge, are emphasised against the contrasting, equally strong vertical linearity of the pine trees. The simplicity and clarity of the built elements highlight the quality of forest. The trees add, in return, through contrast, definition and a peaceful, balanced atmosphere to the built features.



Fig. 54, the stump as a gathering point



Fig. 55, detail plan at the Stump area



Fig. 56, Section DD, pine trees create an effective shield next tall buildings like the AUVA building at right



Core Three | Urban Wilderness

Near the Danube, the landscape under the overpasses acts as a buffer and connecting zone for neighbouring residents. For wild animal users, this is the central area of the design. Patterns of existing vegetation, discussed in greater depth in the following section, are built upon to create a wet woodland habitat rich with native species that support local fauna and pioneer vegetation that revitalises and strengthens soil quality.

The circle element here is a raised wood boardwalk that loops under the highways and

provides users with visual access to the habitat being created without allowing direct access. (See fig. 58) The boardwalk pulls out to create seating areas.

The Urban Wilderness Core is about connection with nature through observation, while minimising direct human and pet disturbance of habitat in the most protected and expansive urban wilderness area.





Fig. 57, current state of the overpass area; bottom right: slightly north of the location of Section BB, see fig. 60. Photos by author.



Fig. 58, Section AA, the Urban Wilderness Core area with rainwater retention and raised boardwalk circle (graffiti from on-site photographs)



Fig. 59, Section BB, site between the sports facilities and residences near the urban wilderness core

2.4 Flora and Fauna

The vegetation strategy has two closely linked organisational concepts. These concepts are intended to use the site's nature in order to tell a story which engages users and unifies its varied areas. The conceptually representative character of the site's vegetation is built on the integration of any vegetation which can serve ecologically, or socially, towards the enhancement of the space. Native vegetation is mixed with pioneer species that help strengthen the health of the soil, but a direct replica of the historic floodplain landscape is not the goal of the design.

2.4.1 Flow

The overall vegetation strategy abstracts the greater landscape of Austria to tell a story and root the design in its specific place, simultaneously building a connected habitat system which revitalises growing conditions. (See fig. 61) The placement of each vegetation group type is closely determined by context and existing site conditions. The initial plantings in the formation of habitat areas are intended as the beginnings of processes. Ideally, succession would take place as the pioneers improve the soil and the natural areas would continue to design themselves, to merge,



Fig. 60, the flow concept, path of the vegetation types from the Danube south to the urban core area



Fig. 61, the flow concept, path of the vegetation types from the Danube south to the urban core area

and to expand. The journey of the vegetation begins at the Danube with a wet woodland habitat. Here, a low point in the landscape means that this area under the overpasses is already vegetated with water-tolerant and water-loving species (see Ch. 1.5.1), and that water tends to pool here. Construction in this area would be minimal: species that bully out more beneficial plants but don't significantly support wildlife, such as Rubus caesius and Buddleja davidii, would be removed, and many existing trees could be preserved alongside new plantings. The overall composition here would include: Salix fragilis, Salix alba, Salix caprea, Salix purpurea, Populus alba, Populus nigra, Betula pubescens, Betula utilis, Betula pendula, Ulmus carpinifolia, and Quercus robur.

In the wet woodland areas, the plantings are more closely derived from the area's historic vegetation compositions in order to offer the most suitable habitat for the native wildlife which has been, and will be, losing supportive landscapes to development. (See fig. 60) See also Ch. 1.5.2, in which the particular effects of developing brownfield areas, specifically including the planned Nordwestbahnhof site, are discussed.

Woodland

Also abstracted from local historic vegetation, which lends the project place specific identity, the flora of the drier woodland areas is similar to that of its wetter counterpart. Species here, roughly in order of those most prevalent, include: *Populus alba, Populus nigra, Betula pubescens, Betula utilis, Betula pendula, Ulmus carpinifolia, Quercus* robur, Salix fragilis, Salix alba, Salix caprea, Pinus nigra, and Pinus sylvestris.

Foothills

Travelling conceptually towards the mountains, the vegetation moves into pine dominant areas. Transition points are planted based on observation of such areas in the forested Alpine landscape, where dominant groups merge and mix with altitude differences and exposure variation, and clearings occasionally offer breath between them. Plantings here include: *Pinus nigra, Pinus sylvestris, Betula pubescens, Betula utilis,* and *Betula pendula.*

Orchard Meadow

The orchard meadow provides valuable habitat and food sources for many animal species by offering many flowering wild herbs as well as regionally native trees that support wild pollinators and birds alike. The tree plantings include: *Malus sylvestris, Pyrus communis, Prunus spinosa, Cornus mas,* and *Sorbus aria.*

The experience of travelling through the entire site is made continuous not only by the consistently present and recurring built elements, such as the boardwalk and bridges, but also through the fluid story told by the vegetation. From the Danube at the northern end, the wet woodlands then transition into woodland, which gradates into the Austrian foothills before returning to wet woodlands again. From there, fruit tree meadows open and invite, and in the culmination point, all of these characters are integrated and direct engagement with each is encouraged. (See fig. 61)

Other species which would either be planted or ideally start occurring as the succession process transforms the site into a thriving ecosystem include:105 106 Adonis vernalis, Allium Poplar Island ursinum, Aristolochia clementitis, Calluna **Birch Island** vulgaris, Clematis vitalba Convallaria majalis, Colchicum autumnale, Cornus sanguinea, Euphorbia cyparissias, Fallopia japonica, Ficaria verna, Gagea lutea, Galanthus nivalis, Pine Island Fruit Island Willow Island

Hepatica nobilis, Hippophae rhamnoides, Iris sibirica, Menyanthes trifoliata, Neottia ustulata, Nigella arvensis, Ophrys apifera, Papaver rhoeas, Paris quadrifolia, Primula veris, Pulsatilla vulagaris, Rhodiola rosea, Sagittaria sagittifolia, Sanguisorba officinalis, Scilla bifolia, Sparganium erectum, Tortella inclinata, Utricularia vulgaris, Veronica maritima, and Viscum album.

2.4.2 Islands

The urban user dominant areas within the habitat zones are conceived as islands within the flow. Like islands in the floodplain, they are formed by the flow and are not disconnected from it. (See fig. 62, 63, 64) The islands are meant to increase engagement of users with the nature, as well as to offer people many varied corners of restful green space to discover within the site. Each island is planted with labeled specimen trees from around the world. These are based on the dominant vegetation of a given segment. For example, in a wet woodland area, one island is planted with willow species from different countries, another with diverse poplars. This method gives each island a unique and distinguishable character, a playful and engaging element of the design. Conceptually, it also connects diverse users in one of the city's most diverse districts (see Ch. 1.2) with their central park: everyone can find a tree that has roots where they have roots, but it's also demonstrated how similar all these worldwide variations of the same tree species are, and how, despite the beauty of their unique characteristics, which also stand out in close proximity, they can together create a highly functional, interconnected green space network.

Fig. 62, the island concept, island organisation and plantings

¹⁰⁵ "Pflanzen in Niederösterreich" <u>https://www.naturland-noe.at/pflanzen</u> (29.07.2024)

¹⁰⁶ Nationalpark Donau Auen <u>https://www.donauauen.at/wissen/natur-wissenschaft/die-donau</u> (18.07.2024).



Fig. 63, Section EE, rainwater retention and temporary wildflower meadow under footbridge leading to poplar island



Fig. 64, view from the willow island with rainwater retention area below



2.5 Shared Use Strategies

One of the central intentions of the design is the integration of habitat and recreational green space. In some

places, the two user groups can be brought more closely together, but in others, it is also critical to have areas, for instance for nesting, which are minimally disturbed by humans and pets. Through observation, more strict and heavy-handed methods such as signage to keep out of areas or fences are rarely as successful as those which simply choreograph the topography, vegetation, and materiality of surfaces to invite human access in some places and gently discourage it in others. (See fig. 65, 69) The following strategies (See fig. 69) are applied throughout the site in order to minimise the access of urban users (people, pets) into areas where greater protection is desired for wild users (insects, birds, wild mammals, reptiles, amphibians). They are diagrammatically depicted in the illustrations below according to the reference numbers.

1 Bridge Level Separation: at some points in the site, the raised rail bed is broken down to allow for more direct human circulation across it; in other areas, the rail bed is broken down to create a difference of levels in the topography in order to a) achieve the desired habitat character, such as wet woodland, based on accentuating existing low points in the context topography, and b) make a clear separation between areas accessible to people and pets and areas which should be observed only. The heightening of the spatial experience for human users is, however, also significant and central here: travelling through the trees' canopies enriches and varies the



Fig. 65, signage in Park am Gleisdreieck, Berlin; although the rabbit in this picture demonstrates that the area is well protected enough, "keep out" signage is often followed by a user-made path it into the protected area behind it

atmospheric qualities along the narrow site, and the observation of thriving habitat from above is also a new perspective.

2 Boardwalk Circulation: the boardwalk is a unifying, consistent element throughout a long and varied project. It is a widely recognisable symbol that it's worthwhile to tread lightly in this landscape. Its very raised quality gently separates nature and circulation.

3 Drop-offs: simple yet effective, creating steeper, small drop-offs to differentiate levels and user areas is perfectly suited to a site which already features such a topography. In many areas, the raised rail is maintained as the circulation area, and the lower areas are utilised for the creation of habitats. Removing more of the earth broadens growing space lower down below the separation



drop-off. The drop-off itself is highly desirable: like such exposed earth walls on the Danube Island where many native pollinators have been recorded (see fig. 68), this landscape elements provide necessary nesting ground for a large number of solitary wild bee species.

4 Dense Understory Plantings: like rocks underfoot, thickly planted shrubs make it physically unwelcoming to step off the path. Natives such as Cornus sanquinea, Rosa arvensis, Salix purpurea, Hippophae rhamnoides, and Staphylea pinnata are proposed. Again the human experience is also part of the intended effect: varying enclosed spaces with more open ones heightens the richness of the sensory travel though the site.

5 Rail and Ballast: leftover fragments of the old rails, as well as retained, or kept and reused, ballast stones from the railway on site, provide excellent dry habitat and hiding places for many wild creatures. Without the need for signage, the material quality already says "keep off." Few aesthetically tolerable barriers could keep people and pets out of an area all of the time, but a rocky ground cover is highly effective purely through being unpleasant and undesirable to walk on. As observed in Atelier Loidl's Park am Gleisdreieck in Berlin, the occasional child finds the rocks enticing, but rarely does anyone else. (See fig. 67)

6 Access Points: by offering ample areas with natural qualities where human users are not only allowed, but encouraged to step and play, the fact that other similar looking areas are less accessible makes them less tempting to explore.



Fig. 66, vegetation division in Park am Gleisdreieck, Berlin



Fig. 67, rocky habitat in Park am Gleisdreieck, Berlin



Fig. 68, exposed earth wall on the Donauinsel; Magdalena Rotteneder







Fig. 70, main plan

2.6 Function and Details

This chapter focuses on more detailed aspects of the design, materiality, and the workings of elements such rainwater retention areas in greater depth.

2.6.1 Rainwater Retention

Because of the historical natural character of the district's floodplain landscape, there is a conceptual continuity in working with water on the project site as a defining quality of the new design. Practically, there are also numerous benefits: better drainage from streets in heavy rains, the creation of wet woodland habitats, and while flooding or severe rainfall events have not been major issues since the regulation work on the Danube, having areas which could serve to hold larger amounts of water in extreme rainfall events given the unpredictability of our climate's future is not unreasonable to consider preemptively. The nature of raised railway beds, designed to efficiently shed water, to become bordered with water loving



Fig. 71, the lower segment of the urban core area where paving would be replaced by the rainwater retention area; the far corner is opened to the intersection behind to create the new main entrance. Photo by author.

vegetation where the moisture pools, was additionally inspiring of the wet woodland centred design approach.

The placement of rainwater retention areas is determined by the topography of the existing site conditions, some of which are then accentuated, and that of the immediate context, as well as on the materiality of adjacent areas. This functional element is then used as a basis for the organisation of vegetation type groupings, so that wet woodland habitat takes advantage of rainwater retention and orchard or foothill woodland areas are situated on higher ground where they can thrive. The upper and lower segments of the site feature the most significant rainwater retention system elements. (See fig. 72) Under the overpasses at the northernmost segment of the site, water has already been observed to pool, and water tolerant and water loving vegetation have also been documented thriving here (refer to the analysis in Ch. 1.5.1). The topography in this area is not dramatically altered, but the addition of some underground drainage which serves the adjacent neighbourhood and empties into the site is also proposed. In the two southernmost segments, comparatively more extensive changes to the site's topography are made, but these are still considered as accentuations of what has been



Fig. 72, rainwater retention strategy



Fig. 73, detail plan at the southern segment where the rainwater retention area becomes an interactive wet woodland play area

observed as the existing conditions in those areas. In the narrower segment, water already tends to collect along the border of the site, as the documented vegetation reveals. The extensive impermeable paved surfaces, mainly parking lots, as well as the lower points in topography, are the main factors leading to this condition. The design takes this a step further by removing large portions of the rail bed mound entirely, allowing circulation by way of a footbridge, and creating an even lower point in the centre of the newly opened area. Proposed underground drainage systems, along with direct runoff, bring water into the site.

The result is effective towards meeting multiple goals: the rainwater is safely retained, and where a circulation bridge is used to create that retention basin, a separation between park users and the wet woodland habitat benefiting from the moist landscape below is also achieved. Should the bordering vacant lots or parking areas ever be transformed into more green space, a connection from one side of the site to the other would already be in place as a lower level circulation under the existing bridge. At the wider main end area, the strategy is similar: the existing low point is accentuated, and this lower strip of land is then transformed into a basin for rainwater retention, (See fig. 71) filled by runoff as well as by underground drainage, and utilised to form another wet woodland area, this one interactive for users to play in as well. (See fig. 48, 73)

2.6.2 Seating and Bridge Design

The designs for the boardwalk bridges and the seating elements are intended to create a sense of coherence throughout the length of the site, to link the design to its urban context, to invite, through its details, engagement and inclusion of all users, and to respect the historic industrial character of the district and site itself. (See fig. 74, 75)

The materiality is simple and consistent: recycled concrete made with on-site materials and optionally, if structurally necessary in the case of bridge supports, with limestone from the mountains that has built many other structures in the city; Corten steel, and wood accents, derived when feasible from the site.

The spatial quality of Vienna could be described as a composition of contrasting counterparts. Weighty stone structures frame spaces almost too massive for the contemporary life of the city and seem to hold the spirit of an empire in the grand scale of the open spaces between solid, balanced facades. But the intricate, fine details of Jugendstil metalwork and wooden whiplash lines are rich and bold enough to contrast yet balance, and not be overpowered by, the weightier structures. This reflects the spirit of the city as well: a nuanced bohemian energy is equally present alongside the calm majesty of a former empire's seat.



Fig. 74, design details for footbridges and bridge railing panels



The design of the built elements in this project are an ode to and reflection of this defining spatial quality of the Austrian capital city, which has long been a cultural melting pot and place of artistic exploration. The solid concrete structures, the angled supports also evocative of railway bridges, have a solid presence within the landscape.

The weighty concrete structure is then topped with thin Corten steel panels. The dark, rich, strong material counters and balances the bright concrete supports. This material is also highly durable, and the built elements on the site are made to last: it is much more sustainable to build decisively and permanently than for disposal and rebuilding to be in constant cycle. The material is also reminiscent of industrial and railroad landscapes.

It is proposed that some panels be perforated with urban river centred landscapes from around the world. The perforations offer the benefit of higher transparency, especially for young, small users. The design of the perforations both reflects what is at the heart of this project-the Danube and its built and natural landscape—as well as directly serving as a welcoming sign to users who have, or whose families have, come to culturally diverse Vienna from other countries. Everyone can find a landscape they know and see the unity between each, the fact that a river shapes so many of our thriving built environments. The bridge panels are meant to be educational, playful, decorative, and representative of one of the most diverse and quickly transforming districts in the city.

The benches continue the design language of the bridges and create a unified spatial character. (See fig. 75) Recycled concrete blocks act as the framework over which Corten steel panels are a weightless skirting. The benches are topped with

Fig. 75, design details for seating elements

wood, lain so as to reflect the railway ties rhythmically running along the tracks. Both backed and backless alternatives are presented. The backless option provides the benefit that, when placed as proposed at least half a metre from the edge of a pathway or boardwalk seating bulge, a user has the option to comfortably sit facing away from the path and the activity on it, instead being visually absorbed in the surrounding nature.

2.6.3 Material Reuse

While the site is clearly transformed into a new character that can optimally serve its current and future community, part of that character is the strength of site specific identity found only in the aspects that have formed its unique atmosphere over time. It is the intention of this project to maintain some of that identity-shaping historic character even as a new life of the landscape takes form. Materiality is a significant quality considered in the attempt to achieve this goal. On one hand, that means using new materials that create a dialogue with the historic and place specific character. But most centrally utilised is the method of reusing, repurposing, and preserving materials and built elements found on the site. This strategy is also brought into central consideration out of the environmental benefits of avoiding the manufacture of more new materials than necessary and of disposing of old materials, both of which have significant negative impacts in terms of sustainability.

Figure 76 illustrates some of the found elements on the site and examples of how they might be reused. One of the main opportunities for reuse is the inclusion of stones and old concrete as aggregate in the concrete of new built elements, whether for structures, such as the footbridges, or



Fig. 76, reuse and repurposing of on site materials

for seating or play elements, such as benches and wetland stepping stones. Another opportunity to use rubble resulting from demolition is as fill under new topographical construction. Much of the area at the site's southernmost segment is a good example; here, a crumbling retaining wall would be removed and its three metre sudden drop would be transformed into a gentle, welcoming slope down towards the new main entrance at the corner of Hellwagstraße and Liepziger Straße. Earth removed from other areas of the site where the rail bed mound is partially removed could also be reused here in this way.

Repurposing materials is another proposed method. If trees need to be removed during construction of the new design, they can be reused as logs in play areas or their wood could be, where possible built into bench tops or boardwalk edges. Remnants of the crumbling retaining wall, as blocks complete with corroded, exposed rebar just as found, are arranged as artefacts of what came before and enhance the spatial choreography by placing emphasis at key places. Ballast stones can be collected and reused in new dry stone habitat areas. With both the retaining wall blocks and the ballast rocks, the opportunity to create varied habitat opportunities for wild users is also a key consideration. Preservation of some elements is also suggested. Where it is suitable based on topography and use, posts from the railway and segments of rails themselves are maintained as they are found. A wall that shielded residences from the railway is partially preserved; it currently is covered with graffiti, and it is proposed that it be kept for this purpose, a place where users can contribute to shaping the design's character as they wish.

2.6.4 Natural Play Areas

Play is a critical way to learn through engagement, and play is therefore prioritised in the design. The main area suitable to play is the southernmost segment, the urban core of the site. Here, a natural play area is proposed. This would feature elements for climbing like logs, boulders, and recycled concrete stepping stones. The wet woodland rainwater retention area running along the lowest point of this area also features a set of large stepping stones at varied heights at one end, inviting users of all ages to climb, explore, splash in the water when it's there, or even find a favourite stone on which to read or talk with friends. The element of play is not restricted to play areas. The design overall is conceived as a playful, and respectful, journey through a constructed strip of wilderness, weaving, stepping up and down, giving users every perspective possible of the nature through which they travel.

2.6.5 Orchard Terrace

In the southernmost segment, the fruit tree meadow is an abstraction of Austria's gently rolling agricultural lands. The dry stone wall terracing is a feature intended to provide effective and valuable

habitat for many insect and reptile species for nesting or finding warmth. Its slight angle provides it with a gentle southern exposure which supports the creation of this habitat. It is also intended to reflect the surrounding vineyards that define the landscape of Lower Austria. (See fig. 77) Space is





provided for resting or picnicking, the atmosphere for which is invited by this familiar structural element of the countryside.

Fig. 77, orchard terrace diagram

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This area also provides accessible connection the the boardwalk from the street level. (See fig. 80)

2.6.6 Lighting

Lighting is intended to be minimally invasive and strong where it is necessary for safety and guidance. The use of directional lighting is proposed, so that light features at specific points can be flexibly adjusted to illuminate pathways but shine less brightly on adjacent habitat areas. (See fig. 78) Foot level lighting within the boardwalk edges is also proposed. Small, bright lights at several metre intervals would brighten the pathway without polluting the surrounding nature with excessive light. While these are featured in the handrails rather than along the path's border, lighting on a stairway up Salzburg's Mönchsberg provide a good example of the quality of light intended here. (See fig. 79)



Fig. 78, directional lighting



Fig. 79, lighting example on Mönchsberg, Salzburg



Fig. 80, Section FF, showing dry wall orchard terracing

2.7 Landscape as Language

This project argues for the high value of heightening understanding and appreciation of nature in order to build the critical desire of people to create and preserve such landscapes in their built environments in the future. Furthermore, it aims to support the claim that design is a critical tool of communication by which to achieve this goal. In other words, it is beauty, play, and the ways in which design speaks and communicates to us through our aesthetic sense that is critical in building positive engagement with and appreciation for the natural systems we need to be supporting and strengthening in our built environments.

The theoretical basis of this argument is that design, and landscape, is a language. It speaks to us through universally strong and recognisable formal elements, such as the circle, as well as through more subtle choreography, such as when we are spatially restricted and then released into wide open space, and the sensual experience touches us emotionally and informs and alters our perception of the landscape through which we move.

Every design decision in this project could be described in terms of language. The circles identify place and bring users together; remnants of railway structures tell the story of the site's previous lives which still shape it as another present layer of a highly complex and transforming system; height differences and materiality of pathways suggest quietly to users where to walk and where to let nature be; stepping stones in random heights beg to be climbed on, explaining that this area of the landscape should be explored; bridges and boardwalks that separate us from wildlife users communicate for those that can't speak that this is their home and should be respected too; worldwide tree specimens and perforated panels tell every user that they are equally valued in the community supported by this urban green space.

Design may be inseparable from natural context, to reference a statement of architect Alvar Aalto with which this report was opened. But design can succeed or fail in communicating something about that nature to users that the designer wishes be understood. It can bring us to a closer understanding with a specific nature or even hinder such a closeness. It can serve the nature along with the human users or do it harm.

Through beauty, through an engaging design language, the value of a landscape can be most effectively communicated to its users. The design aspect of landscape architecture should not be underestimated as a tool towards strengthening the ecologically thriving green networks in our urban environments. Design, and beauty, speak for nature and allow it to be understood. Understanding, and valuing, are central to preserving, supporting, and prioritising.


3 | PROCESS

Development of the Project through Design Sketches Two trips, one in November and one in June, were made to the site, and several days were spent both in careful analysis of vegetation and other details as well as in extensive exploration of the context area. The author also attended several discussions, presentations, and exhibits regarding the development of the Nordwestbahnhof area.

The following are a collection of former iterations and design process sketches.











development of the island concept and planting strategies for the site as a whole







stages of the Stump and its surrounding area, including organisation of the main urban core segment









initial built feature ideas; developing characters of various segments of the site





design process for the footbridges



tree character studies as a basis for the creation of computer rendered trees

4. Critical Reflection

The ecological aspects of this project are made central and used as a guiding framework for the design's organisation and functioning overall. This priority has been addressed on all intended levels: nature and habitat inform the organisation of the site and are closely linked to infrastructural elements such as rainwater retention as well as directly responsive to the varied context and existing site conditions, and they also shape the layout for human user oriented organisation. But while overviews are made of particular plant and animal species which could be part of the systems created on the site, it would be invaluable to take this research further and carefully examine the interconnected life cycles and needs of each species to determine how, more precisely, this habitat system would look within the particular urban context, and to be able to present a more precise framework for supporting such thriving systems in similar urban contexts of other cities.

Further research on the potential for green sites in the urban context to host specific species, as well as the need for networks within the urban landscapes to support those species, and the extent of such networks, would also substantially benefit any future project which has the possibility to allocate space to wildlife, particularly in those with limited areas that need to be maximised. Something of value is inevitably lost through the interference of design. This project strives to balance that loss ecologically by maintaining, and enhancing, as much naturally occurring urban wilderness on the abandoned railway as possible.

The social benefits which an effective transformation of the railway into a usable urban green space could offer the Brigittenau district are arguably equal in weight to the ecological needs that a preserved brownfield area could meet. This is the argument taken on by this project, but while the trade-off for social benefits is given high value based on the analysis, it must be acknowledged that an ecological loss is still present given the changes imposed by a new design, even though many habitat areas are constructed as well.

The losses involved in such a transformation of brownfield into designed green space are not only ecological. As it is, the abandoned railway has its own strong atmosphere which provides an identity to the district and tells a story, and even if some of that atmosphere is preserved, it cannot be maintained completely. And while the site may not be accessed much, it is used in its current condition. The occasional dog walker can be observed on the old rails, and families carry big bags to fill with blackberries. (See fig. 81)



Fig. 81, The Berry Pickers, photo by author

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BETWEEN THE RAILS



HYPOTHESIS: The full potential of the Brigittenau district's former railway segment can only be realised if a currently divisive element of the landscape is transformed into one which creates connections, and the new design provides functionally for both urban and wild users and acts as a fluid core throughout the context area in both ecological and social terms, strengthening networks and provoking the expansion of engaging, and ecologically effective, green space in the district and the city of Vienna.

Socially, the design must be accessible to all and built for all users, reflecting the diversity of the growing Brigittenau district. Ecologically, it must address rising heat levels and serve the community as a green oasis and as functioning lungs of the city, whose urban wilderness areas act as a catalyst for the expansion of this green space typology within the city of Vienri trust provide habitat for the wild fauna displaced by development and loss of valuable brownfield areas. These goals can only be achieved if the design sparks engagement and becomes availed and representative core of the district, which can best be accomplished if historical aspects are respected, accentuated, and built upon-both culturally, the industrial past, as well as ecologically, regarding the floodplain landscape-while the changing future needs of the district which e design must be rooted in history as well as in its response to the demands of the future, anchored decisively in specific place while fluidly open to, and a catalyst of, future transformation.





the design draws from the nature of the Danube and historic floodplain landscape radually breaking down human gade, industrial landscape forms to allow space for habitat and for community use and is open to branch and to broaden its course of flow with time 1 9010

10 WILD USER AREAS | THE FLOW CONCEPT: dra F yst for th ng co VEGETATION: the flow is a journ dland habitats nea Foothills Woodland Aixed Wet Wooldand, Woodland, Meadow Wet Woodland Orchard Meadow

10

SHARED USE STRATEGIES

ofs

bridge level separation

boardwalk circulation/habitat differentiation rail and ballast rocky habitat

A

(V. V.F.

drop-offs

1





CONTEXT MAPPING





RAINWATER RETENTION SYSTEM

the site, whether urban user or wild user dominant, and place three main al and historic one, and an urban one focused on merging users together Birch Island Fruit Island Willow Island Poplar Island ISLANDS | URBAN USER AREAS Pine Island intended for use by humans rest, exercise, and commute CONCEPT: within wild user dominant segments of the o step off the boardwalk; islands create space for every ormer rail, islands are areas between the nature flow which welcome ne: each individual can find a favourite spot within the varied spaces and pets for play, VEGETATION: islands are planted to reflect the diviersity of the city and district; based on the native oriented habitat planting; of a given area, the island is planted with related species from around the world, which are labeled for identification and learning

THE STUMP



dense understory plantings 4+ +

1

nature engagemnt areas: offering specific access points

office STC hu









rubble fill for the shaping of new topography on site

reuse and repurposing of materials and objects found on site is proposed as a critical aspect both futurally and ecologically, of a materials, such as nikely balls or chunked crumbing retaining walls, can provide valuable habitat for many creatures, but their presence also creates samosphere and anchors the design in historic identity, where new structures are needene do idit matierals can often be incorporated as concrete aggregate, for example

-

in por cardient Antipole Antipole

M

I





SEATING AND BRIDGE DESIGN

SEATING: curving wood topped benches built on recycled concrete blocks and skirted with Corten steel add unity to the site; room is left on the outer side of benches to allow rest with more space from boardwak traffic; options for backless seening, are well as bucked benches, are provided BRIDGES: solid structures with metalwork accents and intricate details respond to design characteristics of the city of Vienna; angled supports speak to forms found in allway bridges; Corten steel evolves the historical industrial quality of the site; perforated panel detail: Illustate worldwide uban river landscapes, like Vienna, throughout

Carduelis carduelis Stegliux/Goldinch rests high in restops in sparser tree stance, oben found in readontee rests with ear mannamous, fields on seedd, o filodity find ng wild plu for boe in over mantanad ubure reas:



isters caeruleus else/Funation Blue Tit oecidious and mixed brasts and can be round in parks inders, neas in the holes, will accept nest or boxes, neats of mixects as well as seeds, fir. It and nextar



















Garrulus glandarius Eichellikhertfurasien Jay innante partie and genoens as well as its natural decidu ous forest habitat; car be founce in all off over Austile, det s wide-ranging, form seeos and finistic in social ed oge



Glis glis Suborschlifer/Dormouse oreirs oak and beere commated toress: can be found in when margins, hubiat often cut by development, would particular benefit from surgers, when giscer networks Annuan furms or the fate 2021



Limenitis populi Großer Eixogal/Poplar Admiral Ives in damo areas, feeds on arpen ano bleco poplar trees



Micromys minutus Zwergmaus/Harvest Mouse found in the Dancke Booop ain landscape; inhabits areas with higher vegetation such as need beds, as well as grain fields















Nymphalis antiopa Travermantel/Aduaning Cloak inhabits mostl, lighthal forestroe areas as we I as occarries and arearuse. The cateroil an sector presonninently on circle and withow while zduits prefer fail on fruit



Dsmia papaveris fahr muuerbiene/Poppy Boe restened with estinctions to Gay; nests in self-dug cavice nd lines is nests with poppy lower peaks



Phengaris teleius Helier Wesenknopf Amskenbliking/Scarco Large Blue ravin Subge and by Ind any local yin Loar / Autha, preters extimatedien of In Johann an will all juentar and distins, Lond particularly with Innavece (Sanguioribal its netry oxfusive food source















Picus viridis Grünspecht/European Green Woodpecker proferos toregts garas forests and the edges of orch but can be forend in parts and garders as well, old trees an doso wood are required for its burrowing



Rhinolophus hipposideros Kleina Hufoisannasa/Lassar Horseshoo Bat hurtis risects close to the ground in forests, inhabits semicapen ad sicapes and water edge areas, con bo found in develorment border areas



Girlitz/European Serin numbers ou cick drooping due to loss of vital brownfield areas, fields audiatively on wild herbs and some tree teeds, such as bird and elm; prefers low vegetation, some trees, open landscapes

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