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Article abstract

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Résumé

Cet article trace la morphogenèse de l'un des berceaux de l'industrialisation canadienne : le corridor du canal Lachine à Montréal. Les auteurs livrent une première lecture de l'évolution des artefacts et des formes spatiales qui se déploient de part et d'autre du canal, depuis sa construction à compter de 1819. À l'histoire de l'industrialisation et à celle des communautés ouvrières des abords du canal Lachine, se superpose ici une histoire inédite, celle d'un morceau de ville dont la genèse et la lente sédimentation des formes bâties témoignent et enregistrent l'impact de l'émergence, de l'apogée et du déclin du nouvel ordre économique industriel. Nous démontrerons que l'urbanisation du corridor du canal Lachine est le fruit d'une dialectique complexe entre un ordre spatial résidentiel de faubourg et un ordre spatial industriel de première et seconde moutures. Ainsi, aux tissages et modes d'articulation fins des espaces domestiques et de leurs espaces contigus de socialisation et d'échange que sont les trottoirs, rues et autres parvis d'église, succède ou se superpose un espace divisé et organisé en fonction des flux, tantôt de matériaux et de biens, tantôt d'énergie, qui sont destinés à alimenter la machine industrielle. Les tissus urbains, résidentiels comme industriels, livrent aujourd'hui le témoignage, en dur dans les artefacts, ou en creux, dans les configurations spatiales, des conditions historiques qui les ont vues naître et se transformer.

Introduction

New debates over the future of now derelict or underutilized landscapes of production have prompted a critical examination,[1] re-contextualization,[2] and extension of concepts of built heritage in the wake of de-industrialization[3] in North America and the West. This paper presents the results of an ongoing case study that seeks to understand the history of one such area, the Lachine Canal basin in Montreal, by exploring the spatial dynamics of its particular industrial landscape. Using the theoretical framework and methodological approach known as urban morphology, we develop a historical reconstruction of the underlying spatial logic of the site that reveals a century-long dialectic between industrial and residential spatial orders, informed by major currents in the political, economic, and technological histories of Montreal, and continues to shape contemporary spatial conditions. Our aim is to enrich the understanding of the industrial history and geography of the Lachine Canal by unveiling the role of the built landscape as a structure influencing the industrial urbanization. We argue that the mechanisms of transformation and conservation of the built landscape—the structural permanencies (what remains ingrained in the landscape in spite of ongoing change)—present in the system of the built landscape play a critical role in mediating the actualization of cultural, economic, and technological transformations.

Urban historiography often refers to the material city as a testimony of the living conditions of one group of urban dwellers or another, and regularly cites its concrete forms as evidence of the broad social and economic transformations that affect society. Mysteriously though, the material city, in particular when considered as a dynamic entity, remains one of the great unknowns of urban history. Most theoretical perspectives treat it as a dependent variable, either as a neutral stage on which the human drama is being played or as a passive by-product of social or economic processes. By focusing on the emergence of the built landscape of the Lachine Canal industrial district, this paper theorizes the built environment as a dynamic system of its own, governed by internal sets of relations. Although the city is a material projection of social, political, and economic systems or structures, this projection proceeds through systems of spatial symbolization, and is manifested in a substance, the *built space*, that has its own consistency and resilience.[4]

Such an approach stresses the structural qualities of the built environment, seeing urban material culture not as a reflection of the modes of production or as the sole product of decisions and purposeful building practices of social actors but

as having its own structure and logic, which are imposed on social agents by offering them a substance to work with that is only partially malleable. In this sense, the urban built landscape is socially produced while simultaneously producing society by offering (or withholding) opportunities for agents to realize themselves socially, economically, and culturally.

Urban morphology focuses "on the tangible results of social and economic forces: they study the outcomes of ideas and intentions as they take shape on the ground and mould our cities."[5] The resulting anonymous and structural product, the urban tissue, is the central object of study for urban morphology.[6] In their attempts to understand and elaborate that framework, urban morphologists have pursued a variety of strategies.[7] Some, such as Gianfranco Caniggia and Gian-Luigi Maffei,[8] grouped into an Italian, or 'Muratorian,' school inspired by the work of Italian architect Saverio Muratori, have analyzed the city as a means of deciphering an "operational history" of the built environment as an organism in constant evolution.[9] Other researchers, grouped into a British, or 'Conzenian,' school inspired by the work of British geographer M. R. G. Conzen, such as Jeremy Whitehand, or M. P. Conzen, have concentrated more specifically on "town plan analysis," tracking changes in circulation systems, cadastral arrangements, and building coverage.[10] These studies have situated relationships between agents of transformation and the built landscape in a dynamic historical process.

The history of industrial Montreal has been the subject of extensive research covering questions of architecture and urban heritage: Where Marsan[11] provides an overview of the evolution of Montreal's built landscape and architecture, emphasizing the importance of the rural *côte* and cadastral system, Burgess, Forget, et al.[12] use built heritage as a window through which to read the history of Vieux-Montréal, Legault[13] examines the urban context in which the Montreal triplex emerged, and Sénécal[14] explores the specificity of the port's massive grain-handling structures. These works not only examine architectural achievements as isolated incidents, but integrate them into larger frameworks. For Marsan this examination involves Montreal's history in its entirety, while for Legault and Sénécal, a greater emphasis is placed upon the reflection of cultural origins and practices in urban architecture. Forays into understanding Montreal as a living and working environment include Desloges and Gelly's[15] well-illustrated glimpse into life in the nineteenth-century industrial complex and Deverteuil's[16] visual account of the same landscape in post-industrial decline, both rich iconographic sources. Gilliland and Olson's[17] exploration of the strategic modification of household composition and domestic space highlights the importance of the space inhabited by the working class living along the Lachine Canal discussed by Bradbury[18] Political dimensions of Montreal's industrialization are explored by Linteau[19] in his study of the blending of public and private interests in east-end Maisonneuve, while Young[20] explores the unique and important role played by the Séminaire de Montréal in the parcelling and development of agricultural land in the Pointe-Saint-Charles area. Linteau's and Young's contributions are important in their situation of urbanization practices in their cultural, economic, and political context as means for agents (both individuals and organizations) to use urban land as a strategy for economic gain and social survival.

Tulchinsky's, Lewis's, and Hanna's work on industrial geography and the emergence of industrial suburbs in the southwest of Montreal is rich in its understanding of the pathways created and followed by industrial capitalists as they fashioned already-shaped urban space in Vieux-Montréal and farmland on the fringes of the city to meet their needs.[21] Lewis's work serves as a valuable reminder of the temporally and politically diffuse nature of urbanization through his notion of myriad manufacturing pathways coalescing into an industrial district with complex inter-firm linkages and varying control over the landscape. His work leads us to consider more deeply the morphology of the built landscape as a structural component in that process. These studies geared towards understanding Montreal's industrialization are complemented by a plethora of planning- and redevelopment-oriented built heritage studies commissioned by public agencies,[22] as well as archaeological studies by Desjardins and Provençal that employ a unique combination of archaeology and history to explore the character of the transformations of the industrializing urban landscape and draw significantly upon material culture as a means of reading and interpreting the city and its transformations.[23] Regrouping much of this work, Poitras et al. offer a useful overview of the history of the canal.[24]

In their variety, these studies paint a rich picture of the history of industrialization in Montreal, but do little to interpret the material culture of the landscape or probe the elements, relationships, and processes at work in the industrial landscape as a coherent system. Some morphological analysis of Montreal does exist, including work by Carey on the decline of rear-lot housing in the context of regulatory shifts and the evolution of building types and La Rue's examination of the role of allotment practices in the formation of Montreal's built landscape.[25] Several works integrate economic and morphological factors in attempting to understand Montreal's built landscape. Exploring the weaving of economic conditions and built form, Gilliland[26] offers a comprehensive examination of the processes of street widening and waterfront adaptation and transformation. Through case study findings relating to the emergence of a loft district in Montreal, Zacharias[27] shows that typo-morphological characteristics constitute a form of resistance to redevelopment and have influenced the direction of the growth of the office district. He convincingly puts forward the idea that the morphological structure of the built landscape (in lots, street patterns, and building types) is not only resilient over the long term, but has an important influence over subsequent transformations.

What distinguishes these morphological analyses from the body of work in architectural, social, and economic history and geography is their shared emphasis upon the built landscape as a coherent system and a preoccupation with urban form as a component of material culture, with important and particular physical expressions. These works emphasize Montreal's rapid

expansion during the nineteenth and early twentieth centuries, overlaying a complex geography of industrial and residential districts comprising distinctive building types upon an influential and long-lasting rural route and land subdivision framework, complemented by successive infrastructural systems (canals, quays, railways, and highways). This study of the specialized tissues along the Lachine Canal seeks to complement these works by analyzing the material culture of the landscape and probing the elements, relationships, and processes at work in the industrial landscape, by discerning the logic of the built landscape transformed by industrialization and, as a result, developing a unique understanding of the material landscape underlying the history of Canadian industry's birthplace.

In order to generate historical knowledge using the methodology of urban morphology, we systematically analyzed available cartographic data as a means of identifying subsystems such as the building fabric, circulation systems, cadastral or allotment systems, and infrastructure. Woven into this fabric is a work of interpretation, or an attempt to uncover the interrelationships between these elements, their spatial characteristics, and (trans)formative processes. This interpretive work includes analysis of relationships such as the party-wall system regulating the juxtaposition of adjacent residential buildings, the creation of shipping facilities adjacent to a canal or railway siding, as well as the geographic patterns or spatial orders that these elements present, such as variation in building type with distance from the canal. Following a brief overview of the theoretical basis of urban morphology, we outline our specific methodology and present the initial results of our case study. We developed a flexible investigative matrix that was enlarged as progress was made in the research and our understanding of the components and relationships evolved from close reading of the evidence. Starting with the identification of small components and tentative interpretations of minor relationships among them, this process expanded to the point where we were able to sketch broader categories and more significant historical trends that, we will argue, have played a crucial role in shaping the development of the Lachine Canal corridor.

In order to coherently situate our morphological analysis in its historical context, we cross-referenced our cartographic examinations with contemporaneous iconography and a variety of secondary sources such as historical studies, geographical analyses, planning and development reports, and archaeological surveys. This procedure allowed for the identification of the critical junctures at which cartographic evidence was scrutinized more closely and allowed us to determine that much of the cartographic evidence we analyzed quite closely captured concurrences among major technological, economic, and social shifts, and transformations in the built environment.

The Morphogenesis of an Industrial Landscape: The Lachine Canal Corridor

The creation of the industrial axis along the Lachine Canal has been a long and complex process. From the first plans in the early eighteenth century to the almost endless series of enlargements and renovations undertaken from the 1840s onward, it has always captured the imagination and has been perceived as a structuring element of great importance. Our case study focuses principally on the second basin of the Lachine Canal, centred on the Saint-Gabriel locks, for a variety of reasons. It represents a site that has consistently been urbanized, and from the mid-nineteenth century until very recently, been continuously and intensively used for industrial purposes. Additionally, the site was the setting for the entirety of the transition from a rural, artisanal economy to an urban, industrial one. Finally, the site has always mixed residential and industrial uses, and is of contemporary interest for its heritage value and as a brownfield site attractive for redevelopment and conversion in a post-industrial context.

Bypassing the Lachine Rapids, through a formerly agricultural area dominated by the Saint-Gabriel farm and extensive Sulpician holdings and forming a navigable link between the Great Lakes and the lower St. Lawrence River, the Lachine Canal is a project with a long history. François Dollier de Casson took up the cause as early as 1680, but these early attempts were halted by administrative reticence, a massacre at the hands of the Iroquois, and uncooperative geology.[28] Following private efforts by the Company of the Proprietors of the Lachine Canal that subsequently received public support, it was opened in 1825.[29] After 1843 large installations such as the Redpath sugar refinery, the Cantin shipyard, and the Ogilvie flour mill, and later on the Steel Company of Canada, set up shop along its banks and took advantage of the area's workforce and railway access.[30]

The working-class neighbourhoods of Saint-Henri, Pointe-Saint-Charles, Petite-Bourgogne, and Griffintown, through which the canal runs for much of its course, have been dramatically shaped by the canal's presence, and industry. The canal, like the railways that followed, was part of a larger continental system that lay at the basis of the colonization and settlement of western North America, and whose infrastructures, industries, and built landscape need to be understood not just as an urban tissue particular to Montreal, but as the manifestation of a continental scale of territorial and economic development.

In the following analysis two key themes emerge from this history: the long-term importance of the early allotment system, and the enduring influence wielded by the introduction of the first industrially scaled elements. The oscillation between a residential and a specialized (in this case industrial) spatial order that plays out along the banks of the Lachine Canal owes its characteristics and outcomes in large part to these themes.

The Agricultural Background

Although the Lachine Canal did not open to navigation until 1825, the variety of canalization projects undertaken in its guise during the French regime left a significant imprint on the rural landscape, most particularly in terms of the *côte* system of land subdivision and access, which laid the foundation for settlement by constituting a coherent territorial unit consisting of long,

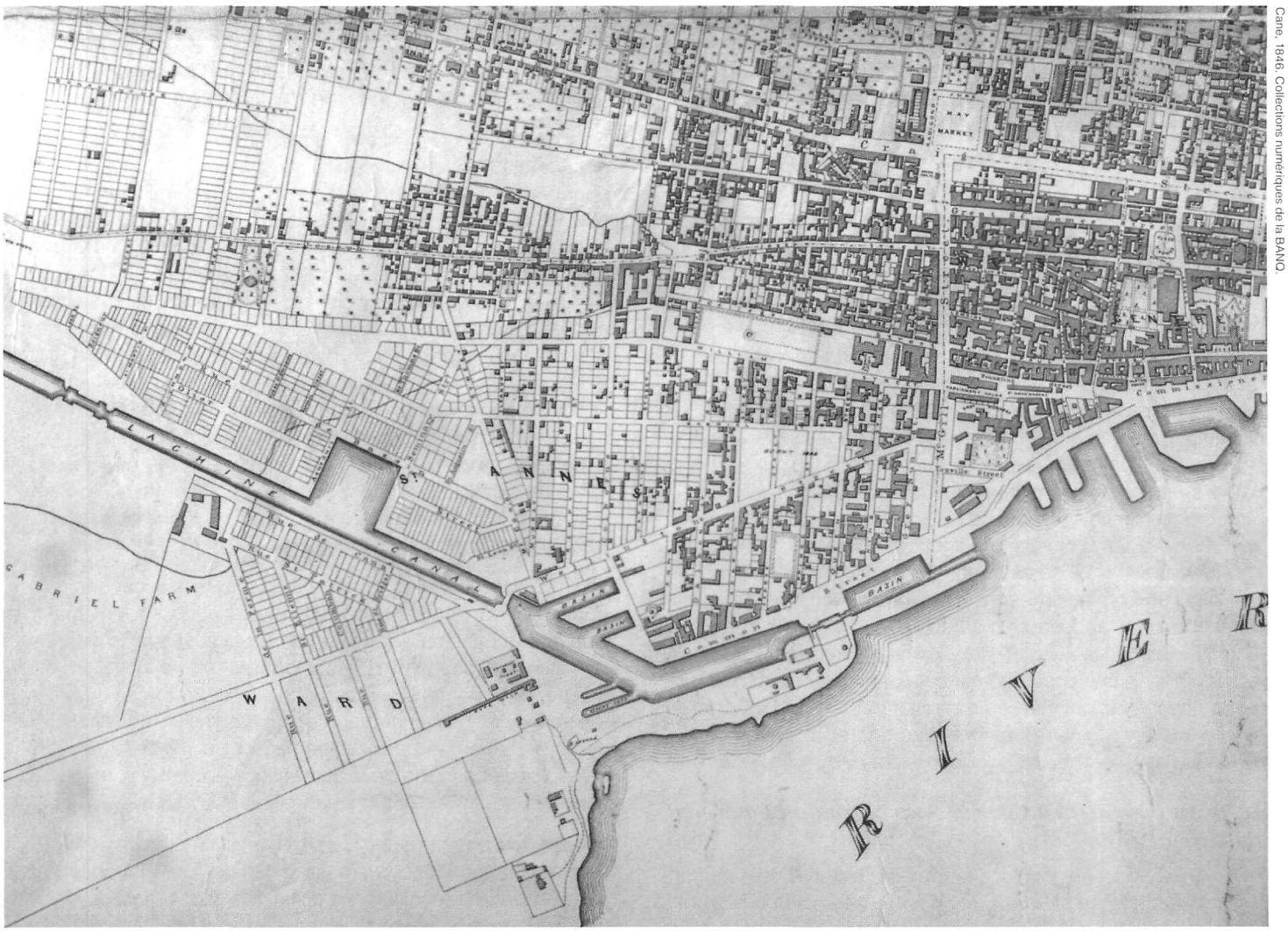
Charland, 1801. Collections numériques de la Bibliothèque et Archives nationales du Québec—BANQ.

Figure 1: The rural southwestern fringe of Montreal, 1801.

narrow landholdings fronting onto an access road, which took the name of the *côte*. The first routes were generally rivers (especially the St. Laurence) and gradually *côtes* and *montées* (routes connecting different *côtes* and penetrating farther from the water) opening up territories further inland. The map produced by Charland[31] illustrates the inherited structure of the agricultural allotment system and the importance of Notre-Dame and Wellington Streets as initial routes upon which the settlement system was centred (fig. 1).

Among the first *côtes* to develop on the Island of Montreal were those related to the current Lachine Canal corridor, most specifically the Côte Saint-Pierre, Côte Saint-Paul, and the Côte des Argoulets (now Verdun).[32] Proto-urbanization gradually occurred at the extremities of this corridor, in the parish of Lachine and at the periphery of Montreal, in Griffintown and the village of Saint-Henri-des-Tanneries, named after the water-reliant artisanal form of production found in the area.

In morphological terms, thinking of these *côtes* as matrix routes, or *percorso matrice,* is useful as a starting point for understanding the pattern of early occupation of the territory and grasping the overall structure of land subdivision and principal routes. These main thoroughfares connecting settlements preceded and structured subsequent urbanization. They were usually highly sensitive to topography and hydrology and were often informed, as in Montreal, by rural cadastral patterns. Matrix routes served as vectors for urbanization and thus they provide a key to understanding the rural landscape and its shifting landholding structure at the time of urbanization. Many *côtes* in Montreal became matrix routes, often evolving into the main or high streets of the neighbourhoods that formed around them.[33] The first land routes and the initial pattern of settlement remain deeply ingrained in the organization and orientation of streets and cadastral lots in the canal area that continues to influence current occupation. These early routes and the allotments branching from them are important



Carte, 1846. Collections numériques de la BANQ.

Figure 2: The allotment system responds to the new potential of the canal, 1846.

traces on the landscape that provided a framework for future intensifications of settlement and the introduction of industry.

1846: The Early Growth of a Hydraulic Industrial Complex

In the 1840s and 1850s, the canal began to have a major impact on the surrounding landscape. The Canal Commission decided to enlarge the Lachine Canal in 1841, thus increasing not only the canal's usefulness as a transportation link, but opening it up as a source of energy, embarking on a pilot project on the most promising site, Basin No. 2, and granting the first hydraulic energy rights. The landscape was being altered to accommodate the beginnings of an industrial district.[34] This early urbanization and industrialization was founded on three bases: the subdivision of the Sulpicians' and other orders' seigneurial properties, which provided the opportunity for residential development; the renovation of the Lachine Canal, which attracted industries to its banks; and the introduction of the railway, which reinforced Montreal's position as a hub and led to the creation of an important industrial complex in Pointe-Saint-Charles.[35]

The subdivision in the 1840s of the agriculturally oriented, *côte*-based allotment system was a product of challenges posed to the seigneurial system, and most specifically its monopoly on milling rights.[36] The transition towards a manufacturing-based capitalist economy occurred at the same time as the canal was refurbished with the development of hydraulic power in mind by a British government, and advocated for by a group of predominantly British merchants. The 1845 subdivision of land into hydraulic lots near the Saint-Gabriel locks can be understood as a conscious strategy by British entrepreneurs and the Sulpician seminary to exploit canal-side lands for use by future residents as well as potential residents and commercial or industrial clients.[37] The subdivision and creation of town lots was undertaken by John Ostell, whose involvement in later phases of the industrialization of the canal took a variety of forms. At this stage, Ostell appears to have drawn

on his familiarity with French surveying techniques,[38] and the town lots he laid out, arranged in two rows, back to back, constituted an artifact and a system—an urban tissue—dating back to the French regime.[39] This typically residential urban tissue emerged as the base of an important structure in later years and is the focus of many of the distinctions we make in this paper between residential and industrial spatial orders.

The allotment system as mapped by Cane in 1846[40] displays the relative lack of specialization of industrial in comparison with residential built forms. The introduction of a large, square-shaped basin, as well as the conversion of the old canal alignment for hydraulic energy announced the arrival of a new spatial order, responding to more specialized economic and technological imperatives. While the size and, for the most part, the configuration of the lots suggest established residential allotment precedents, the attraction of the canal was evident in the orientation of adjacent lots, especially those next to the basin; these no longer followed the matrix route of Wellington Street, but shifted orientation to respond to the canal. In terms of urbanisation and development along the course of the canal, only Griffintown showed any degree of settlement, featuring densification from a semi-agricultural residential base. This transition from rural landscape to urban, in the southeast corner of Griffintown along Wellington Street, was marked by increasingly large buildings that occupied multiple parcels or large parcels formed by the fusion of multiple smaller parcels and second, smaller buildings on small parcels aggregated into a larger unit (such as a row house) according to a party-wall system.

1879: An Established Energy Source and an Emergent Industrial Zone

By 1879, when Henry Hopkins completed his atlas of Montreal[41] a significant degree of urbanization had taken place (fig. 3). Industrial development was concentrated near three sites: along the second basin, around the Saint-Gabriel locks, and near the fourth lock, at Côte-Saint-Paul. These sites all had one thing in common: they were ideal sources of hydraulic energy. When the canal was enlarged in the 1840s under the supervision of Public Works engineer A. E. Barrett, the idea of exploiting its hydraulic potential was finally carried to fruition.[42] This opportunity was seized through the creation of the St. Gabriel Hydraulic Company, formed to purchase the hydraulic lots surveyed by Ostell. In the early 1850s, the acquisition and subdivision by John Young and his coterie of many of the hydraulic lots created along the 1825 canal alignment was responsible for much of what can be observed in 1879 (fig. 4) and resulted in the development of the Saint-Gabriel locks as the most important hydraulic site in the Montreal region.[43]

In terms of urban tissue, much changed between 1846 and 1879. The contents of the empty triangle on the 1846 map were now revealed: the Pointe-des-Seigneurs, a bustling complex of mills, foundries, and manufacturers, with an allotment system oriented towards the canal. The basin was reconfigured from a single square into two elongated basins, with another two proposed enlargements and reorganizations prompted by the needs of the lumber industry. The construction of a pier reduced the area of the basin, but doubled the linear footage of the banks, hence doubling the space for industrial (un)loading and storage.

Changes in the urban tissues surrounding the canal between 1846 and 1879 were marked by an increase in scale and specialization. Whereas the basin of 1846 represented a significant change from the rural canal of 1825 and 1834, it was still situated in urban tissue of a residential logic. The basins of 1879, however, penetrated much more deeply into the surrounding tissue, much of which could no longer be characterized as residential. A process of specialization and increasing complexity unfolded, which increased lot sizes, generated new building forms, and established new relationships between buildings and the other components of the urban tissue (most notably streets and lots). In addition to their considerable dimensions, the warehouses along the pier in the 1879 basins had a relationship with the water that was fundamentally different from that of the plots of land facing the 1846 basin, which were arranged almost as though around a residential square.

This specialization was contemporaneous with wider social, economic, and technological changes associated with the shift from a principally agrarian, artisanal economy to an urban industrial economy.[44] Two important factors signalled this passage from a semi-rural artisanal cluster to an urban, technologically advanced and energy-intensive industrial complex: the organization of the canal as a source of hydraulic power and the development of the Canadian railway network under the direction of the Grand Trunk Railway.

In 1879, many enterprises were still dependent upon hydraulic power, though many were using it in tandem with coal to generate steam, resulting in a distinctive spatial pattern in the distribution of industrial tissues, with clusters around two of the three sites of hydraulic power: the Saint-Gabriel locks, and along the second basin. Griffintown was undergoing a transformation towards larger buildings and parcels or the aggregation of smaller buildings across multiple parcels, while the introduction of a railway link between Pointe-Saint-Charles and the port via newly created Brennan Street resulted in a new alignment that introduced a fundamental change in the orientation of this section of tissue now sandwiched between the water and the railway, with two edges—also two important infrastructures—nearby, which made standard mid-block plots sought-after locations close to a new infrastructural lifeline.

Concomitant with the these transitions, the urban tissue was beginning to undergo a transition from initial subdivision schemes informed by the local residential tradition to emergent specialized layouts responding to the new technical imperatives of industrial production. At this stage, there appeared to be a precarious balance between industrial and residential spatial orders. There were some specialized tissues, but they were clustered around specific points where hydraulic power was available, and were surrounded by predominantly resi-

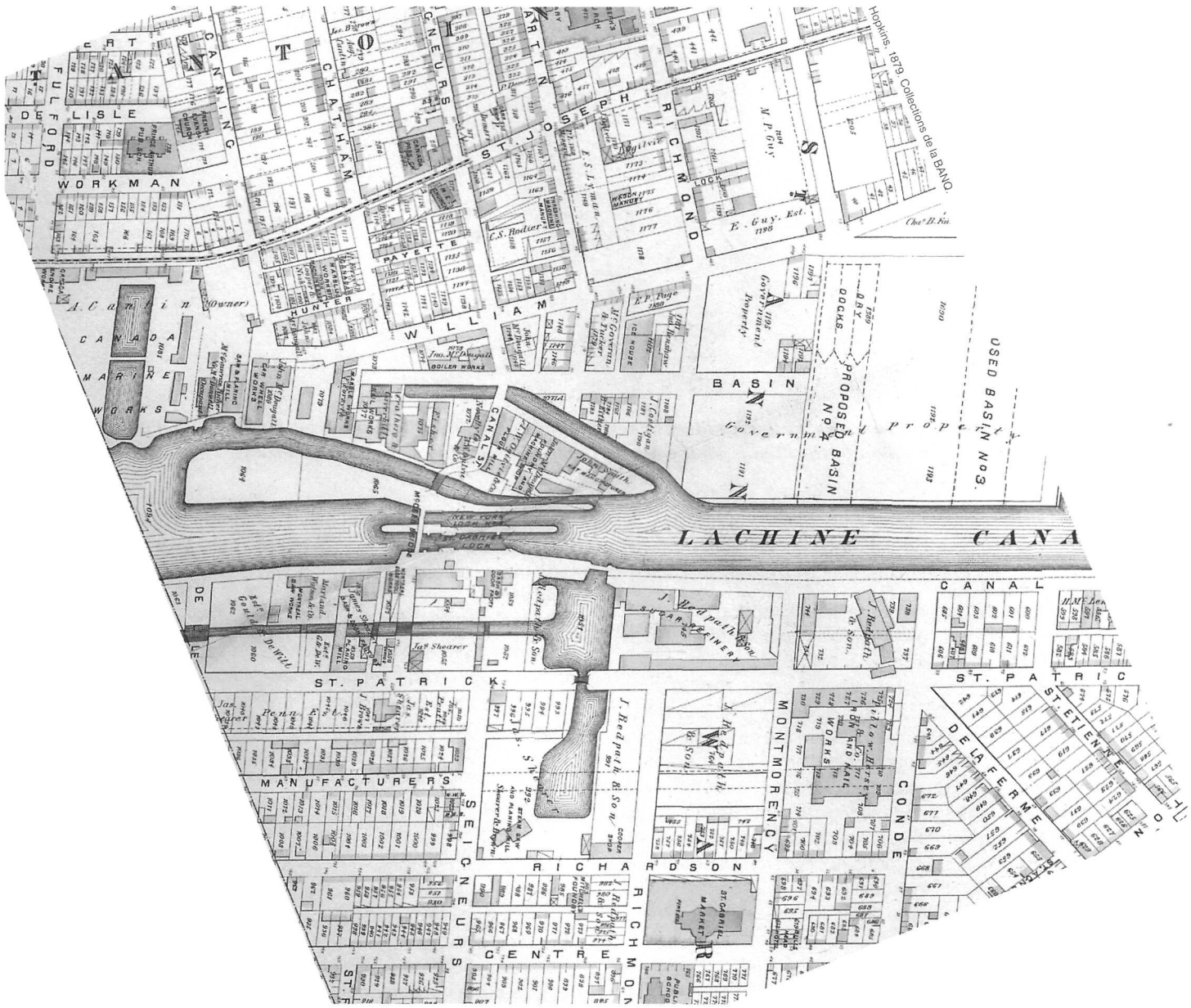
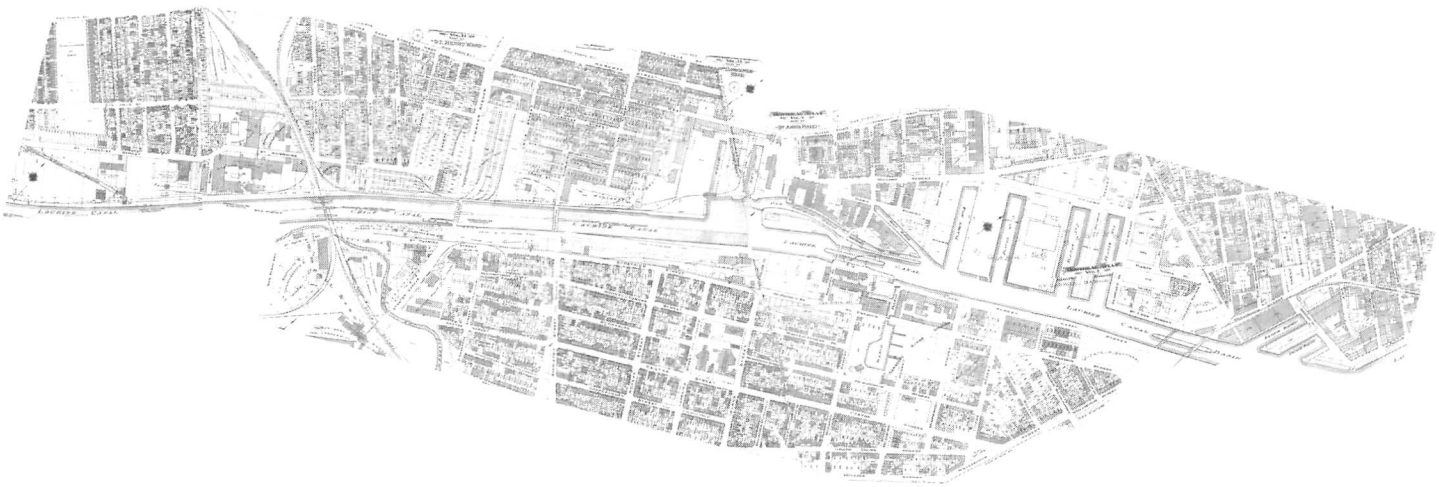


Figure 3: The hydraulic complex at the Saint-Gabriel Locks, 1879.

dential tissues. In contrast to the increasing irregularity of the emergent industrial clusters (as they responded to imperatives of production and transportation instead of domestic construction traditions), the majority of these non-specialized, residential tissues had a fairly consistent set of syntactic relations among components such as buildings, lots, and streets. Where the residential spatial order prevailed, urban densification entailed the appearance of row houses connected by party walls, creating an enclosed, perimeter block. Access to the interior of the block, or to the rear of the lots, necessitated the creation of carriageways, a process similar to that undergone in the suburban fringe of Quebec City.[45] Thus in addition to being a set of characteristics, residential and industrial spatial orders were also sets of rules and processes for urban transformation.

1890: An Expanded Industrial Corridor Fuelled by National Growth

The balance between industrial and residential spatial orders began to shift by 1890. For technological and economic reasons, industry had greatly expanded beyond the small cluster around the Saint-Gabriel locks. Economically, the favourable conditions created by the National Policy led to growth and prosperity for the Lachine Canal corridor. Technologically, steam was increasingly replacing hydraulic power as an industrial energy



Goad, 1912. Collections numériques de la BANQ.

Figure 4: A new infrastructure arrives: railway sidings enervate the corridor, following Saint-Patrick street on the south bank, and following the precedent of the basins on the north. Composite of plates from Goad 1912.

source.[46] Also crucial was the growth of continental railways, which had important impacts for Montreal economically[47] as well as morphologically in the restructuring of urban space.

On the ground, these shifts had a significant impact upon the balance between residential and industrial spatial orders. No longer confined to the hydraulic lots of the 1850s, industrial buildings now occupied former residential spaces, for instance on the north side of the canal, where the Montreal Rolling Mills and the Augustin Cantin shipyard extended the industrial scale as far northwards as Notre-Dame Street. The Montreal Rolling Mills, by virtue of their geographical juxtaposition with the residential area of Sainte-Cunégonde, offered an interesting glimpse into the industrial spatial order. Key characteristics included the breakdown of the traditional syntactic relationship between street and building, the spread of individual buildings over multiple lots, and the emergence, especially in large complexes, of internal circulation and open-space systems independent of the street system. The Montreal Rolling Mills appeared much more tightly related to the water than to the surrounding street grid, and featured a complex set of internal spaces and pathways between buildings that only occasionally connected with adjacent streets.

On the other hand, the structural nature of residential urban tissue was highlighted by the arrival of industry into residentially plotted Sainte-Cunégonde. The form of the Dominion Wadding Company building at the corner of Napoléon and William streets was bound by and related to street grid and block configurations that corresponded to residential practice. In contrast to the manipulation and reformation of urban space at the basins, the Dominion Wadding Company facility represented a process in which urban tissue proved less malleable and where industrial imperatives were not able to fully shape the built landscape that was structured by a remarkably resilient spatial order. Non-specialized subdivision practices, similar to the platting of town lots by Ostell in the 1840s, left a durable trace on the built landscape that noticeably structured future industrialization. The contrast between these two modes of industrialization and urbanization became more marked in the following years.

1912: Railway Sidings and the Industrial Spatial Order

Between 1890 and 1912, the canal itself did not undergo major change. Space on the banks, however, continued to be transformed by the development of emergent industrial complexes (fig. 4). In particular, this new wave of industrialization spilled over into adjacent residential zones. Again, technological and economic factors were behind much of the change. The technological forces included an increasing use of electricity instead of steam or hydraulic energy, as well as the penetration of a network of railway sidings on both sides of the canal.

The railway siding network highlighted differences within the dialectic between residential and industrial spatial orders that favoured either specialization of the built landscape for industrial purposes, or industrial adaptation to residential parameters. On the north bank, railway sidings followed the former towpath and penetrated the adjacent tissue perpendicular to the canal. As with the basins, the residential spatial order of recognizable configurations (streets, buildings, and lots grouped into somewhat regular blocks) as well as dimensions was transformed by an industrial imperative to maximize the area served by the infrastructure, by the linear footage of properties adjacent to the basin or railway siding. In these cases, industrial activities such as loading or unloading shaped the urban tissue in a way that no longer resembled the residential spatial order, introducing large-scale elements (such as basins and railway sidings) that supplanted the traditional circulation system (generally the local street pattern) and had the potential to dramatically change the traditional syntactic relations between building and street. The movement towards an industrial spatial order, achieved first by the basins on the north side of the canal, was in this way continued by the new network of railway sidings and yards (fig.

Goad, 1890, Pinsonneault, 1907, Goad, 1912, Collections numériques de la BANQ, Ville de Montréal, 2002).

Figure 5: The permanence of large installations: From the Brewster basin to "Super C Foods." (Top left, 1890; top right, 1907; bottom left, 1912; bottom right, 2002)

5). In 1890, the Atwater rail yard site consisted of a basin lined by several large plots. By 1907, the basin has been filled and divided into an additional two lots. By 1912, the railway yards had moved in, and echoed the scale and spatial order, and syntactic relations with the surrounding tissue, of the basin before them. By 2002, a large-format retailer was preparing to occupy the site: a post-industrial presence on the banks of the canal. Once established, the industrial spatial order was very resilient and continued to inform even the most recent interventions.

On the south bank of the canal, tension between industrial and residential spatial orders was resolved in a way that illustrates the structural importance of the residential spatial order. The main Canadian Pacific rail siding extended from the western section of the canal near the town of Lachine, following Saint-Patrick Street, parallel with the canal, for much of its length. This configuration was in contrast with that of the north bank, where the siding ignored the street network and instead concentrated most activity (and therefore the principal facades of industrial buildings) along the canal. This alteration of the familiar syntactic relations between buildings and the other subsystems of the urban tissue—according to which all buildings have "addresses" and a presence on a given street—denoted the emergence of a spatial order corresponding to the imperatives of continental industrialization. Where, on the north bank, the Atwater rail yards followed the precedent of the basin and penetrated deeply into the surrounding tissue, the yards south of Saint-Patrick Street, between Island and Shearer Streets occupied only half of a block and were perfectly fitted into the residential allotment system that conditioned their form and placement. The Atwater yards occupied four large parcels (a legacy of the previous Brewster Basin); in comparison, the Saint-Patrick Street yards spanned over a dozen standard residential lots.

In terms of implications of the balance between residential and industrial spatial orders, the introduction of the railway siding system illustrated the divergence between the conditions prevailing on the north and south banks of the canal. The north bank

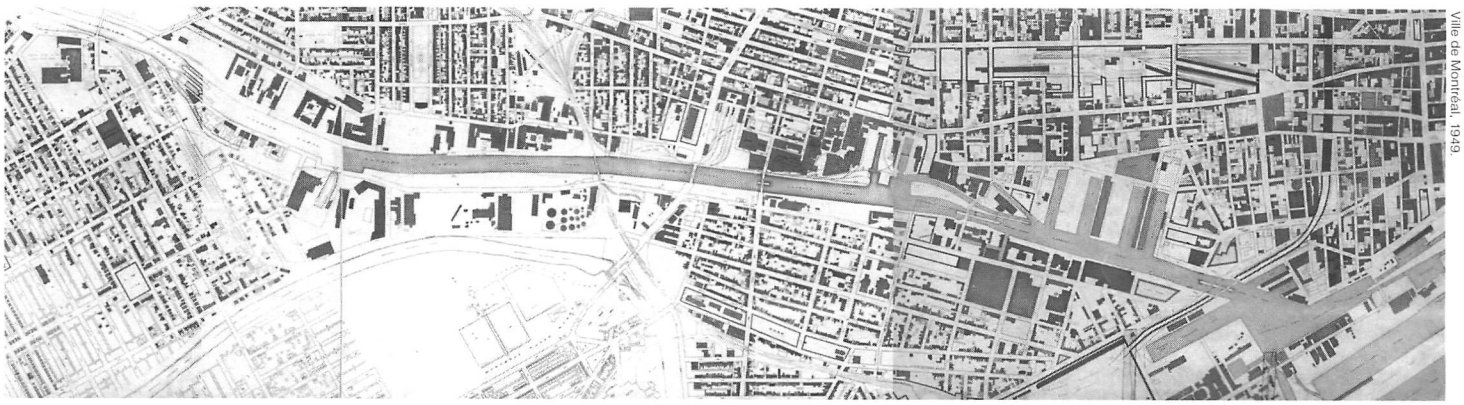


Figure 6: The fully industrialized Canal. Composite of plates from Ville de Montréal, 1949.

was shaped by the particular needs of industry and was increasingly distinctive in comparison with the typical urban landscape; on the south bank, however, industrial construction adapted to the resilient residential urban tissue and took forms that largely corresponded to the typical urban landscape in Montreal. This outcome was strikingly similar to the precedents established by the first basins, and by the first large factory complexes on the north side, which brought to light another key theme revealed by this historical reconstruction: the longevity and resilience of the first industrial-scale elements along the canal's northern bank, and the long-term nature of their structuring impact.

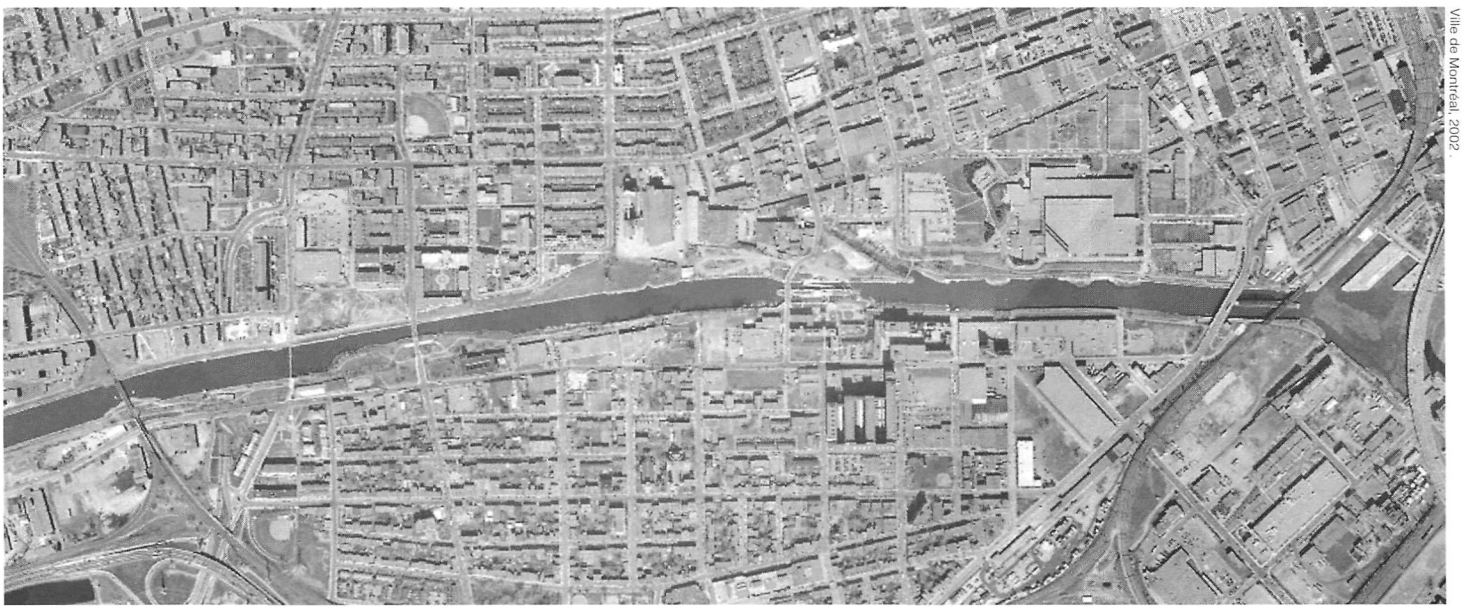
1949: The Climax Phase of the Industrial Corridor

The period between 1912 and 1949 showed an extension and an intensification of earlier trends. Large factories and warehouses continued to locate ever farther from the canal, and the few areas of residential occupation along its southern bank had now been claimed for industry (fig. 6). The system of rail sidings has been expanded somewhat, but in addition to the mobility provided by electric power and, from the 1920s onwards, greater use of the truck allowed for increased industrial dispersion, enhancing the allure of locations farther from major industrial infrastructures. Principally among the large manufacturers, such as Canada Sugar (Redpath) and Dominion Bridge, the truck changed not only transport between factories or points in the city, but also of small goods within the largest industrial compounds, permitting more intensive use of areas not served by boat or train. These effects began to be seen in the dimension and configuration of the major industrial complexes, as well as in their spatial relations with transport infrastructure. Much as decreased reliance on hydraulic energy sources allowed for an expansion of industry away from the canal, the increased prevalence of the truck allowed industries to spatially extend earlier processes of specialization and increasing complexity. Again, the Montreal Rolling Mills (later the Steel Company of Canada—Stelco), were a good example of this phenomenon, as they were closely connected to basin and railway siding networks, but also had a fairly substantial internal circulation network that connected in multiple places with the street grid.

1949–2002: The Recessive Phase: Deindustrialization and Urban Fallow

The most important physical change that marks the period from 1949 to 2002 affecting the spatial evolution along the Lachine Canal eludes cartographic representation, especially at the local scale. The map of 1949 (fig. 7) captures a high point in the canal's importance, and also a peak in the expansion of the industrial spatial order, with the canal lapsing into decline following the opening of the St. Lawrence Seaway in 1959, and final closure to navigation in 1971, which sounded a death knell for the industrial canal. Between 1949 and 2002, virtually all of the basins in the study area disappeared, replaced by large industrial facilities, vacant lots, and recreational facilities. The Nordélec (Northern Electric) factory and the Canada Post distribution centre, both of which were built on large parcels made available by the filling of basins, present an interesting contrast across a long time span. Where the Nordélec partially maintained a relationship with the street in line with a residential spatial order (at least on a syntactic level, if not in terms of scale), the Canada Post facility across the Canal continued the tradition of a dominant industrial spatial order, though this time with an automotive inflection. The new facility turned its back to both the canal and the surrounding street grid, focusing its primary orientation toward its adjacent parking and truck-marshalling area. The trend towards the clearing of ancillary structures and the creation of large open spaces, which emerged in the 1949 map, accelerated dramatically between 1949 and 2002. In some respects, this response to truck marshalling and cargo-handling needs may be analogous to the maintenance of open spaces adjacent to basins and rail yards, or coal-storage areas as part of industrial complexes.

Another point of significance was the disappearance of Canal Street (fig. 9). The original residential allotment of the parcels surrounding Saint-Patrick Square and their development prior to 1949 for residential purposes became obscured. By 1949, the entire block had become the home of the Car and Foundry Company, yet still there was open access to the waterfront, and for all its size, the factory had a direct relationship with the street and the canal. This was a considerable erosion of the residential



Ville de Montréal, 2002.

Figure 7: The Lachine Canal corridor as a linear park, 2002.

Goad, 1912, Montréal, 2002.

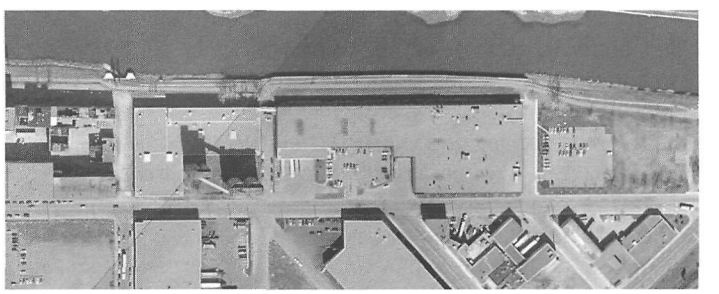


Figure 8: The disappearance of Canal street, Goad, 1912 (above); Ville de Montréal, 2002 (below).

spatial order that was for long so entrenched on the south bank of the canal, particularly in the area around Saint-Patrick Square.

The relinquishment of this area for purely industrial functions (possibly encouraged by significant automobile traffic on Wellington Street) was expressed in this purge of the residential relation between the canal and the adjacent block. The difference between the old and new relationships—the elimination of a recognizable public space (the street) between buildings and the canal—may be analogous to prior transformations of the Saint-Gabriel basins, in which specialized forms responding to the trans-shipment needs of industry superseded more traditional arrangements based on the idea of the street. This phenomenon has implications of particular importance for current efforts to convert the canal to a recreational and residential space, which may have difficulty creating a viable public realm using morphological arrangements that are suited to industrial activity.

Much new residential redevelopment occurred in proximity to the Atwater market, particularly in Sainte-Cunégonde surrounding the former Stelco site. Although the area immediately west of the Saint-Gabriel locks has already been mentioned in the context of an influential residential spatial order, myriad other factors contributed to its recent renaissance. However, the match between the residential spatial order, especially in terms of the key subsystems of the urban tissue, and the geographic distribution of recent construction, is striking. Residential uses were much more forcefully implanted where the residential spatial order was strongest in shaping industrial development. In some cases, reuse of industrial buildings occurred in a fashion that exploited industry's adaptations to the residential spatial order, while in others residential conversions exploited the uniqueness of their post-industrial settings.

Reflections on Spatial Orders and the Evolution of the Built Landscape

This historical reconstruction tells the story of the dialectic between residential and industrial spatial orders as it played out throughout the urbanization of the Lachine Canal corridor in the nineteenth and twentieth centuries. This dialectic was shaped in large part by the resilience of early decisions regarding the placement of infrastructure, as subsequent industrial interventions essentially followed the path of least resistance, either continuing to establish an industrial spatial order where precedent allowed, or deferring to the residential spatial order where it could not be overcome. The interaction of these two spatial orders resulted in a unique and highly variable urban form composed of a variety of tissues that could be arrayed along a continuum, from being almost entirely part of the residential spatial order to almost entirely industrial. In this sense, the resilience exhibited by the urban tissue suggests the importance and permanence of certain structures, notably the allotment system and the canal infrastructure, and the impact of that permanence upon the configuration of subsequent development. These two orders can be conceptualized by reading the actual artifacts' spatial layout, which encompasses a variety of configurations that urban tissue could assume through history, and a characteristic set of dimensional thresholds, configuration of subsystems and components, and syntactic relations by which subsystems and components are located relative to each other and to other objects.

The residential spatial order is familiar: not being a specialized environment, it has a recognizable circulation system (a grid of streets) and allotment system (usually consisting of modular, interchangeable lots), and a set of building types common to much of central, working-class Montreal. Additionally, these subsystems and their components relate to each other in familiar ways: houses are built close to the street, with backyards or small ancillary buildings occupying the centre of an aggregation clearly recognizable as a block. Rows of buildings (joined through a common party-wall system) face each other across streets, forming a typical streetscape, or what Italian typo-morphologists[48] have termed a typical *contrada*, or a unit formed by two *pertinent strips* (rows of facades lining the side of a street) and a segment of street. The familiarity of this overall model is of long date: Locally, Young[49] notes that Ostell was asked to subdivide part of the Saint-Gabriel farm into "town lots," while Legault[50] speaks of the emergence of a typical architecture and urban tissue in the last quarter of the nineteenth century and Gauthier[51] provides evidence of a similar model in Quebec City with roots in the French regime.

The industrial spatial order, on the other hand, breaks precedent: it is a specialized environment whose subsystems and components are not typical in the non-specialized built landscape and are certainly deployed in relationships that do not reflect familiar practice and long-term social habits, for instance, but rather the changing imperatives of industrial production. Industrial building types are often irregular: the specialized results of multiple modifications to accommodate particular technologies, energy sources, or production processes. Their relationships with the circulation and allotment systems may depend more upon creating a loading/unloading zone next to a nearby basin, or accessing a source of hydraulic energy, than on conforming to the typical party-wall system or replicating a culturally valid model of a front garden or balcony. The industrial spatial order comprises an irregular street grid, and often makes use of significant internal open spaces for circulation between different areas of an industrial complex. Infrastructure such as railway sidings or canal basins wields extraordinary influence in the shaping of the specialized tissues that belong to this order.

What the historical reconstruction above tells us is that far from being distinct and separate entities, these orders have long been engaged in a fluid and dynamic dialectic. The distinctive patterns of industrial urbanization on the north and south bank illustrate the extent to which certain features of the two spatial orders offer constraints and opportunities for their expansion and transformation over time. The prevalence of the industrial spatial order on the north side of the canal is in large part due to the structuring impacts of first, the organized exploitation of hydraulic power on the north bank of the Saint-Gabriel locks; second, the construction of the first basins on the north bank of the Canal; and third, the similarly structured organization of the railway siding network. On the south bank, however, the residential spatial order appears to have been much more resilient, forcing industrialization to conform to a remarkable degree, visible through the syntactic relations between subsystems such as infrastructure and allotment systems (rail yards conditioned by the residential allotment system's modularity) and the preservation until 1912 of an inherently residential relationship between the canal and the neighbouring blocks near Saint-Patrick Square.

Concluding Remarks

In a context of deindustrialization, large tracts of former industrial land are becoming available near the centres of many western cities, sparking debate over the appropriateness of conversion and the cultural significance of these pieces of the urban landscape that embody the industrial era. This work represents an attempt to identify and interpret the physical history of the built landscape, through a case study examining the spatial logic and evolution of these environments as dynamic artifacts and specific products of the material culture. Using a methodology predominantly inspired by urban morphology, and building upon morphological analyses of Montreal by Marsan, Gilliland, and Zacharias that began to unveil the components and dynamics of Montreal's urban tissue,[52] we were able to shed light upon the durable and complex nature of a part of Montreal with great historical and contemporary relevance.

The interpretation of cartographic evidence uncovered a complex dialectic between two distinctive spatial orders (residential and industrial). We uncovered recognizable spatial patterns in the fine folds and articulations of domestic space, the utilitarian space of the courtyards and the public space of the streets, which clearly denoted the practices of the everyday

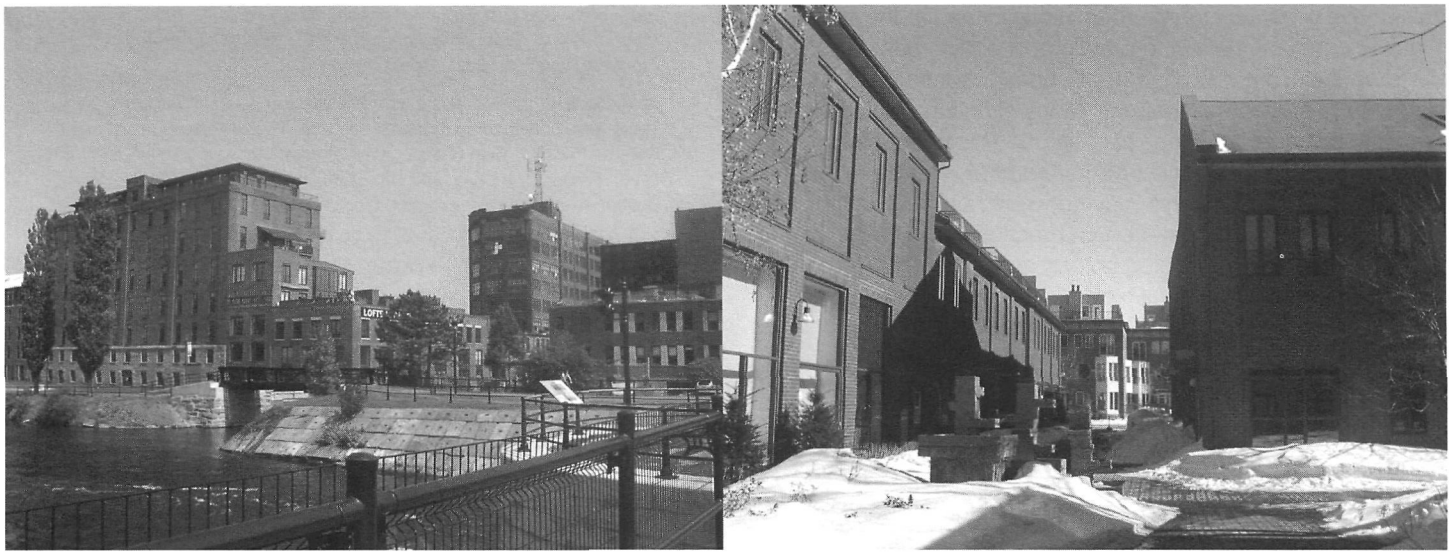


Figure 9: Current manifestations of the dialectic between spatial orders: residential conversions at the Redpath Basin and the Montreal Rolling Mills (Stelco) site, 2004.

life of the local population. Previous research in Quebec City points to the fact that these building and inhabiting practices of the industrial era are inscribed in the historical *longue-durée* and are part of a vernacular tradition that has its roots in the French regime era.[53] Morphologically speaking, this residential spatial system is deployed within a framework composed of local geo-morphological features, inherited agricultural allotment system, and an old rural routes network—all conditions that contribute to the local architectural identity.

The conditions that preside at the early subdivision of residential tissues contrast with those prevailing at the industrialization of the Lachine Canal. This industrial machine, along with the transportation and energy production networks that feed and serve it, are parts and pieces of a nexus of production spaces of continental proportions. The building of such a machine, the functioning of which is based on constant flows of goods, materials, and energy, presupposes significant and concerted efforts, including massive public and private investment. Yet in spite of the apparent disparities between the production of the residential and industrial spatial orders, the fluid nature of the dialectic between the two, as well as the historical longevity and resilience of certain spatial configurations, played a role in determining outcomes in the geographic distribution of the two spatial orders.

Among other things, the analysis exposed the interplay of morphological constraints and potentials for change, by conditions of stability and mutability ingrained in the built landscape itself. In this sense, the built landscape offered a balance between the need for adaptation of subsystems and components to suit the constraints or opportunities of particular locations or critical junctures in history on the one hand, and structural permanencies in the built landscape on the other. These permanencies ensure a minimum of spatial coherence within the whole; for example, the fitting of a rail yard to the modularity of a residential allotment system on the south bank of the canal and the longevity of the traces left by such interventions in the urban tissue.

This research illustrates that the urban built landscape, as any other component of the material culture, is far more than a series of discrete artifacts. Morphological research helps to establish and understand the system by which an environment as a whole is created, and in which artifacts have meaning. A discrete artifact is generally comprehensible only in relation to its surroundings, which are liable to change through time. It would be a mistake, for instance, to single out a few buildings for their alleged testimonial qualities and to deem these artefacts "historical" and deserving; such selective protection measures fail to take the selected parts of the built landscape into account as manifestations of an ongoing process with a particular logic. Our analysis, focused not on building types or buildings but on urban tissues, offers an understanding of the material system in which these artifacts were produced by uncovering an underlying spatial system that structures the relations between the components of the built landscape as well as the cultural, economic, and technological factors that contribute to the formation of that landscape. We contend that using a morphogenetic approach as a starting point to comprehend how an environment is structured offers a productive way to distill their significance as elements of a dynamic material culture comprising a collective and temporally diffuse product that we term *urban tissue*. It is our hope that understanding and interpreting urban artifacts of heritage value in this embedded way will complement the theoretical and practical work of geographers, historians, or archaeologists through revealing new understanding of the material place in which so much of Canada's industrial history was made and which has attracted so much interest.

As a complex cultural form, urban tissues stand at the intersection of spontaneous building practices of a local population and purposeful planning and development practices. In making the built environment, various forms of cultural expressions intermingle in complex webs of relations. This paper stresses that the making of urban tissue—its *morphogenesis*—is the outcome of a dialectical interplay between purposeful planning practices, everyday "spontaneous" practices, and the structural resilience of the inherited built environment itself, as well as of the material culture of which it is the product. As a result of close cross-referencing of historical research with morphological analysis, we were able to propose that, particularly in the industrial spatial order, change of a social, technological, economic, and political nature has important repercussions for the built landscape. It appeared in turn that the system of the built environment has its own logic, and that urban tissues and other structures corresponding to the residential and industrial spatial orders exert what could be described as a mediatory influence upon these changes. Knowing that the urban tissue of an industrial district is not the conscious project of any one agent, historical period, or technological paradigm, but rather the collective product of many, allows for an understanding of the built landscape that privileges its role as a mediator of social and economic life that offers agents varying opportunities and niches, but never full control.

This formulation has repercussions for understanding historical and geographical research in that it allows for such work to be viewed in light of a built landscape of variable malleability and accumulated historical thickness that plays an important role in structuring the opportunities and constraints faced by social agents and that is in turn modified and transformed. Rather than being a simple backdrop to historical drama, the built landscape is an active component that—through the permanence of its traces and logic—imposes conditions and offers itself as a resource to the agents of history. Thus not only are social agents, from industrial capitalists to the Séminaire de Montréal, and from the humblest small builder to the largest speculator, engaged in social and economic networks within their society, but they are also engaging with the built landscape and all of its past in accordance with the conditions and advantages it offers, in order to realize themselves, as social, economic, and cultural beings. The complex processes of cultural "structuration" of which the built environment is the result endow even the most humble and prosaic inherited urban and architectural forms with an unsuspected cultural value.

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