

# APPENDIX C

## BROWNFIELDS CASE STUDIES



# BROWNFIELD CASE STUDY ANALYSIS

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## 1.1 Case Studies Overview

To provide on-the-ground experience as a foundation for this Regional Brownfield Scoping Project, research was conducted on select case study brownfield projects in the metro region and across the state. The study collected quantitative data on costs of cleanup and economic impacts of redevelopment, along with qualitative information on lessons learned, common challenges, and characteristics of successful projects.

Based on input from the Technical Review Team, Metro staff, and the consulting team, a set of 29 representative brownfield properties were identified and examined as case studies. Site selection was conducted on a statewide scale to draw from a greater regional perspective and to illustrate the full breadth of opportunities and challenges. Careful consideration was taken to incorporate a wide range of site characteristics, including size, location, use, and redevelopment strategy.

Preliminary public records research was conducted for each of the sites. Sources references included the Oregon Department of Environmental Quality (DEQ) database of contaminated sites, Metro's regional land use information system (RLIS), and city and county database websites. More detailed information was collected through interviews and written surveys of people directly involved with the case study projects including private developers, owners, and public agency staff.

## 1.2 Methodology

The case study analysis was overseen by the brownfield project Technical Review Team (TRT). The TRT includes a range of policy experts, technical professionals, public agency staff, private sector professionals, and non-profit organizational leadership. TRT members were asked to identify and recommend contaminated sites that have undergone, are currently undergoing, or plan to undergo a cleanup and redevelopment process.

Once case studies were identified, staff conducted preliminary public records research for each of the sites. Sources references include the DEQ website, ECSI database, PortlandMaps, and County GIS database websites.

A survey questionnaire was designed to collect additional information from a primary contact involved in site cleanup and/or redevelopment. At least one individual for each site was contacted to inform them of the study and request participation in the survey. Staff attempted to contact an even share of private and public sector participants. Electronic surveys were administered to collect basic, factual information for each case study to allow

for objective comparison and categorization into brownfield typologies. Follow-up calls were conducted in some cases to elicit additional responses.

Site specific attributes collected by the survey include the following :

SITE INFORMATION	CLEANUP	REDEVELOPMENT
<ul style="list-style-type: none"> <li>• Location</li> <li>• Ownership (past and present)</li> <li>• Acreage</li> <li>• Historical use</li> <li>• Current use</li> <li>• Property value (prior/post)</li> <li>• Metro 2040 and URA designations (if any)</li> </ul>	<ul style="list-style-type: none"> <li>• Extent of contamination (as % of site)</li> <li>• Class of contaminants (metals, petroleum, etc)</li> <li>• Contaminated media (soil/groundwater)</li> <li>• Regulatory Pathway (VCP, ICP, PPA, Order)</li> <li>• Cost of cleanup</li> <li>• Funding sources</li> <li>• Length of cleanup process</li> <li>• Funding sources available (grants, claims, loans, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>• Type of reuse</li> <li>• Intensity of development</li> <li>• Jobs yielded (temp. and permanent)</li> <li>• Redevelopment costs</li> <li>• Funding sources (grants, equity, loan)</li> <li>• Length of permitting process</li> <li>• Level of other local investments</li> </ul>

Participants were also asked to provide qualitative comments on their overall experience with the project, including lessons learned, difficulties, and successes. Responses were intended to identify opportunities and challenges associated with financial and regulatory issues.

**Case Study 1**— Case Study 1 is located in inner Northeast Portland. The property was formerly the site of a metals reclaiming company and later an auto repair garage. These previous uses left more than half of the 0.7 acre site with soil contamination, including metals, PAHs, and PCBs. PDC restored the site into high density residential using tax increment financing and federal EPA grants.

**Case Study 2**-Case Study 2 is a downtown property located in Central Oregon and is the site of a former gas station. The redevelopment effort included the 0.3 acre gas station, as well as the entire city block which had been impacted from groundwater contamination relating to gasoline and associated VOCs. The City redeveloped the site into government offices using Oregon DEQ Orphan Site Account funds and contributions from liable parties.

**Case Study 3**—Case Study 3 is the site of a former gas station, located in Western Oregon off Highway 101. The 0.9 acre site had petroleum related contamination in both the soil and groundwater. The City is redeveloping the site for public use as a parking lot with restrooms, picnic tables, and bike racks. The project is a result of a community visioning process and was realized through volunteer work, contributions from the liable party, and a Prospective Purchaser Agreement.

**Case Study 4**—Case Study 4 is a former battery recycling facility in North Portland impacted by lead contaminants in the soil. The small 0.3 acre site was redeveloped into offices for a neighborhood organization, which provides employment services and other community development programs. Financial assistance for the project was provided through the Portland Brownfield Program.

**Case Study 5**—Case Study 5 is a mixed-use, transit oriented development in North Portland. The half-acre site was formerly occupied by a gas station and auto repair shop, with petroleum-related soil contamination. The site was redeveloped via the Portland Brownfield Program.

**Case Study 6**—This small site was redeveloped into a mixed-use development by a religiously affiliated social services organization. The site struggled with soil contamination issues related to methane, heavy metals, and petroleum as a legacy of the site's formal industrial use. The project received financial assistance from the Portland Brownfield Program.

**Case Study 7**—Case Study 7 is located in Portland's Old Town and is a former rail yard. The property had issues with soil contamination that included lead, arsenic, and petroleum product. Portland Development Commission redeveloped the site into office space and housing, with associated open space, using tax increment financing.

**Case Study 8**—Prior to redevelopment, Case Study 8 was an abandoned rail yard on the edge of Portland's Old Town and Pearl Districts. The site suffered from soil contamination and was redeveloped with a mix of uses through the use of tax increment financing and financial contributions from liable parties.

**Case Study 9**—Case Study 9 is a six-acre site located in outer Northeast Portland. The property was previously a site for agricultural chemical formulation, leaving behind associated soil and groundwater contamination. Redevelopment occurred through the use of a Prospective Purchaser Agreement, private equity, and a public low-interest loan from Business Oregon.

**Case Study 10**—Case Study 10 is located in the downtown of a Portland metropolitan suburb with nearby light rail access. The 3.6 acre site was once occupied by a dry cleaners and had soil contamination related to solvents, PCE, and degradation products. The site has been restored through private equity, loans from Business Oregon, and an EPA innovated technology

grant. The future use will likely remain commercial, but no redevelopment has occurred to date.

**Case Study 11**—Case Study 11 is located in industrial North Portland, along the Columbia Slough. The eight-acre site was almost entirely contaminated from previous uses related to oil processing and petroleum bulk storage. The cleanup has been in process for twenty years and is a result of the site assessment program. No public funding has been used for its restoration. The site has not undergone redevelopment, but will be divided for multiple uses.

**Case Study 12**—Case Study 12 is a 50-acre site located in Oregon's Rogue Valley. Only a small portion of the full site experienced contained contamination, both soil and groundwater, due to previous on-site harvesting and production of hops. Cleanup actions have been funded through grants via the Oregon Brownfields Redevelopment, American Recovery Reinvestment Act, and Oregon Coalition Brownfield Cleanup funds.

**Case Study 13**—Case Study 13 is an industrial parts repair and custom parts manufacturer in industrial North Portland along the Columbia Slough. The majority of the approximately two-acre site suffered from both soil and groundwater contamination due to its adjacency to an old construction debris landfill and oil re-refining facility. The owner plans to make property improvements on-site, but no major redevelopment is anticipated.

**Case Study 14**—Case Study 14, located in Lane County, is a 220-acre site once occupied by a timber mill. Historical operations led to soil and groundwater contamination on about half of the site. The City used public low-interest loans and public grants to restore the sites. Redevelopment plans, currently underway, include revitalizing industrial uses at site of a former mill, and residential townhomes along the adjacent river.

**Case Study 15**—Case Study 15 is located in Linn County, and is the result of a collaborative effort between City staff, Oregon DEQ, the local Urban Renewal Area, and developers. The site was an operating foundry and pattern shop from the 1930s to the 1960s. Historical uses had left the site contaminated and blighted in the City's downtown core. Today, the site is a mixed-use development containing apartments, townhomes, and office space.

**Case Study 16**—Case Study 16 is located in Southeast Portland, just east of I-205. The site contained soil and groundwater contamination resulting from previous site uses, including storage, refinishing, and a sales facility for grocery and retail store fixtures. The project has received financial support from various public sources including the Portland Brownfield Program and EPA's Targeted Brownfield Assessment (TBA).

**Case Study 17**—Case Study 17 is located in industrial North Portland, along the Columbia Slough. The historical uses of the 15-acre included truck and trailer storage, liquid freight handling, and tanker cleaning services. A local trucking and storage container business purchased the property using a

Proposed Purchaser Agreement with DEQ to revitalize the property and expand business operations.

**Case Study 18**—Case Study 18 is located in Portland’s South Waterfront District. The neighborhood is a hot bed for redevelopment, with access to public transportation and other urban facilities. The former shipyard site had been used for ship dismantling, scrapping, and metals recycling operations. The 8-acre site was redeveloped by the owner via the VCP program. Redevelopment plans are still in development.

**Case Study 19**—Case Study 19 is located in an industrial area of Northeast Portland, just west of Portland International Airport. The property had been previously occupied by a construction company, medical testing laboratories, a drum recycler, and airline services, leaving petroleum related contamination, chlorinated solvents, and PCP in soil and groundwater. Remedial action began in the fall of 2010 with the installation of a bioremediation system.

**Case Study 20**—Case Study 20 is a locally owned and operated coffee shop that was once the site of a gasoline service station. Soil and groundwater contamination cleanup was funded through the DEQ Underground Storage Tank Orphan Site Program and a Prospective Purchaser Agreement. The site’s downtown location in a metropolitan city contributed to the site’s success.

**Case Study 21**—Case Study 21 has been nationally recognized for the collaboration between public and private partners and has set a new standard for industrial brownfield redevelopment. The property was formerly the site of an aluminum plant and was purchased by the Port of Portland via a Prospective Purchaser Agreement. The effort required the remediation of 700 acres of industrial property. Since its redevelopment, a national logistics services company has established a warehouse onsite, employing approximately 800 workers. Once the site is fully built out, the Port estimates the project will yield nearly 3,500 jobs.

**Case Study 22**—Case Study 22 is an environmentally friendly biofuel station, once the site of a gasoline service station. The site is located south of Eugene along I-5. The site’s petroleum contamination was restored with public assistance from the Brownfields Cleanup Grant, Oregon Brownfields Revolving Loan Program, and the Oregon Department of Energy Sustainable Loan Program.

**Case Study 23**—Case Study 23 was a former automotive service station located in the downtown of a Northwest Oregon town. The entire city block required environmental restoration work to address petroleum related soil and groundwater contamination. The site is being restored using funds from the American Recovery and Reinvestment Act and DEQ’s Leaking Underground Storage Tank Program. No redevelopment plans are in place to date.

**Case Study 24**—Case Study 24 is a project lead by the City of Portland’s Housing Bureau in Southwest Portland. The property had been the site of a night club since the 1950s and had petroleum-related contamination in both the soil and groundwater. The redeveloped site is a mix of apartments and townhomes, including senior and workforce housing. Site construction includes a variety of green infrastructure and low impact development features including green roofs, rain gardens, and pervious pavement.

**Case Study 25**—Case Study 25 is a Portland Harbor Superfund site located in industrial Northwest Portland. The site was previously the location of a chemical producer until 2001 and has a complicated set of soil and groundwater contamination issues. Some initial cleanup efforts have been completed, though property owners remain in negotiation with the EPA to determine the details of official liabilities and cleanup obligations.

**Case Study 26**—Case Study 26 site is located along the Columbia Slough in North Portland. The site was developed in the 1940s as a calcium carbide manufacturing plant and was plagued with PAH, cyanide, and metals contamination in the soil.

**Case Study 27**—Case Study 27 is located in the Columbia River Gorge and was the site of aluminum reduction processing over the course of multiple decades, beginning in 1958. The site was designated a federal Superfund site in 1987 and delisted in 1996. Since, cleanup activities have continued to address remaining contaminants, including cyanide and fluoride in both soil and groundwater. Site cleanup is largely completed and awaiting NFA designation. Upon completion, NW Aluminum will be one of largest industrial shovel ready site in Oregon.

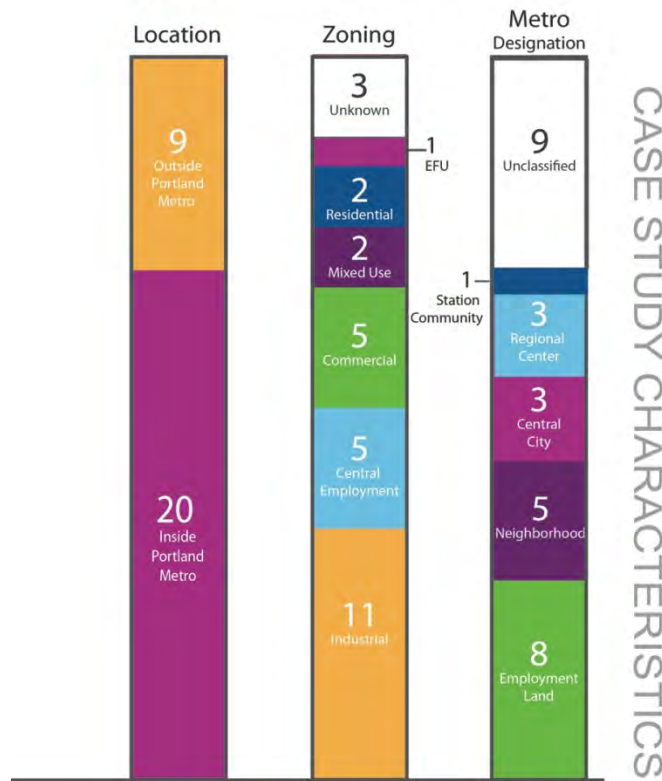
**Case Study 28**—Case Study 28 is just north of the City of Corvallis. The property is home to a former plywood mill site. Soils and groundwater in the former plywood mill area are contaminated with low levels of pentachlorophenol. The site has undergone site investigation and a Targeted Brownfield Assessment.

**Case Study 29**—Case Study 29 is 25-acre site located in North Portland in the City’s industrial sanctuary. The site’s previous use as a sawmill and industrial distribution site left lead contamination in the soil and groundwater, as well as PAH in soil. Sediment samples revealed that the site is a source of contamination for the Portland Harbor Cleanup efforts are further complicated by an underground plume originating from the contamination of an adjacent property.

## Data Summary

The case study analysis evaluated 29 contaminated sites, more than half of which yielded qualitative survey responses and personal perspectives. A summary of general site characteristics are listed in the chart below:

## Of 29 Sites.....



**Survey Limitations**—Several challenges emerged during the case study research. First, understanding the trends of brownfield cleanup projects generally involves collecting sensitive and sometimes confidential information. Even after cleanup, property owners are often reluctant to divulge information that is not already in public record. Financial data was particularly difficult to collect.

The complexity and number of parties involved in a cleanup project makes acquiring a full picture difficult. In ideal cases, both public and private sector entities were engaged to provide feedback. However, private property owners were often difficult to contact or reluctant to participate. Public agency staff were more responsive to information requests, but had limited time and resources to volunteer for completing surveys.

### 1.3 Case Study Findings

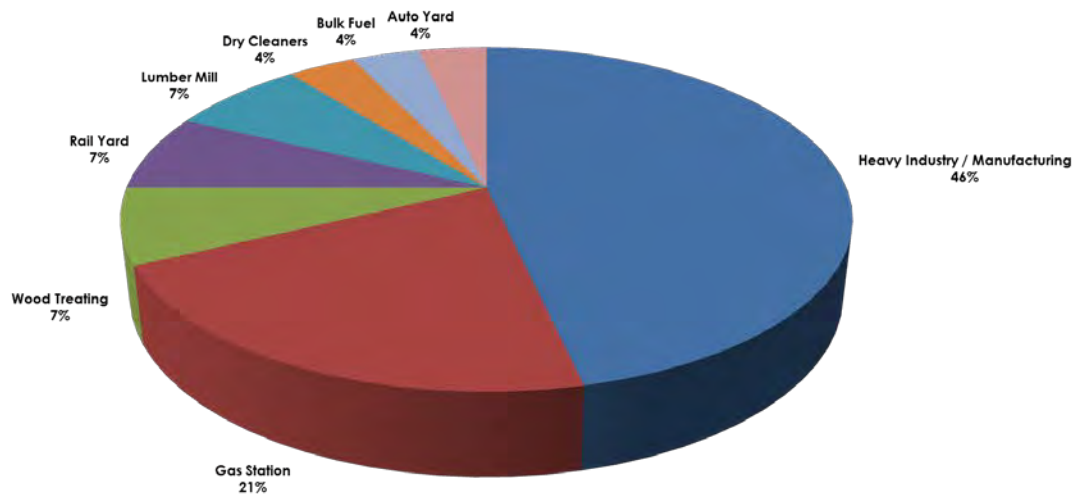
The case study research provided valuable, consistent, and informative results despite the inherent limitations. These case studies provide important information to characterize brownfield properties, the challenges they face, and key factors that lead to successful cleanup and redevelopment.



### 1.3.1 Brownfield Contamination

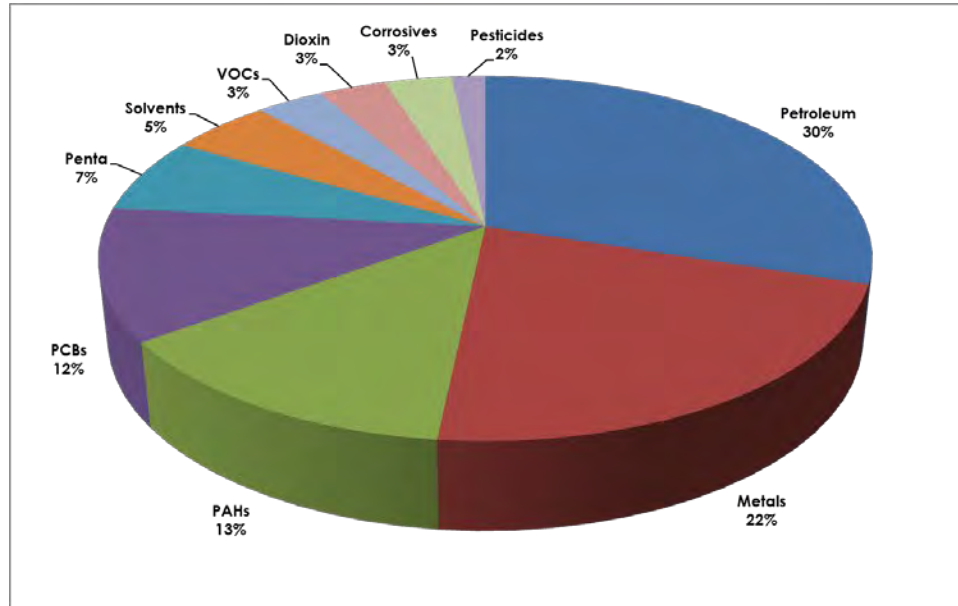
Contamination on brownfield properties is commonly related to historical activities that occurred before the passage of modern environmental laws. The case study projects represent a wide range of past uses and contamination types that are representative of the industrial history of the Portland Metro region. The most common historical uses on the case study properties were heavy industry/manufacturing and gas stations, representing 46 percent and 21 percent of the case study sites respectively (See figure 2-1). The industrial/manufacturing category broadly includes processing of raw materials and chemicals, machining, and fabrication.

**Figure 2-1. Historical Uses of Case Study Properties**



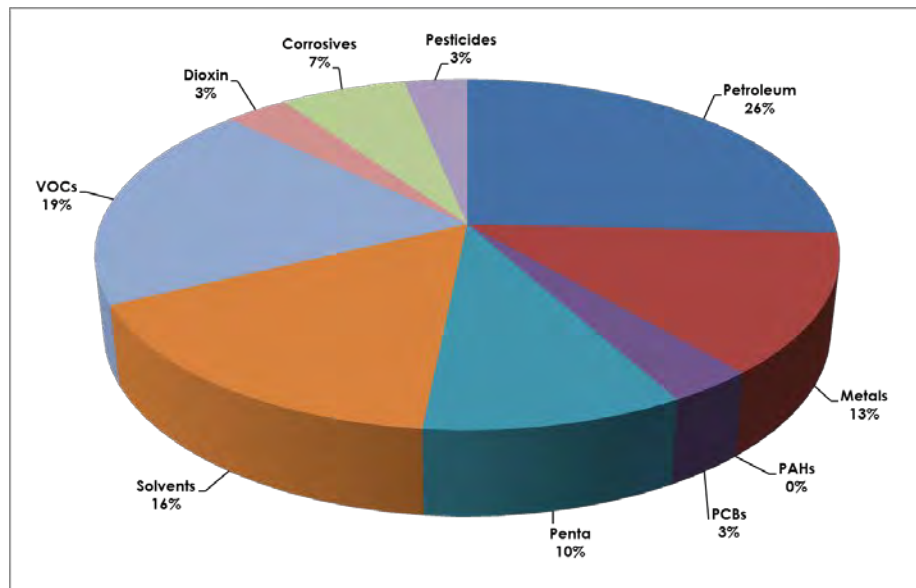
Contamination on the identified brownfield properties is commonly found in soil, but can also occur in groundwater and river sediments. The most common contaminants in soil in the case study projects were petroleum, metals, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). The hazardous materials are associated with the use of heavy machinery and automobiles. Petroleum and PAHs can be released from storage tanks, spills, or leaks from machinery. Metals contamination in soil can occur from the friction of machinery parts. (See Figure 2-2)

**Figure 2-2: Soil Contaminants in Case Study Properties**



Common contaminants in groundwater include petroleum and petroleum-related compounds including PAHs along with volatile organic compounds (VOCs) and solvents. These compounds tend to be soluble and leach into groundwater, while metals tend to bind to the soil. See Figure 2-3

**Figure 2-3: Groundwater Contaminants in Case Study Properties**



The prevalence of these contaminants is consistent with the DEQ database of contaminated sites and aligns with findings of similar studies in Washington State and nationwide.

### 1.3.2 Cleanup of Brownfields

The case study projects are representative of the range of complexity and cost of brownfield remediation. The self-reported time to complete site assessment and cleanup varied from 1 to 23 years, with an average of 8.3 years and a median of 5.5 years (16 of 29 sites reporting). The median duration aligns well with analysis of the DEQ database of contaminated sites that indicates an average of 4.5 years to complete the cleanup process in the agency's Oregon Northwest region (as compared to 5.5 years in the Eastern and 3.5 in the Western regions of Oregon). Despite that, many sites in the DEQ database do complete the cleanup process in less than 2 years. This is generally considered to be a longer timeframe than what is experienced in other regions of the nation.

The duration of the cleanup process can be elusive to pin down because many sites have long histories and periods of activity and inactivity. In addition, survey respondents may have varying perspectives on what marks the beginning or end of the process. Survey respondents were also asked to identify what they perceived to be the longest step in the cleanup process. The most common responses were: site assessment, conducting the actual cleanup action, negotiations with the regulatory agency, and securing financing.

Like the duration of the cleanup, the reported costs of cleanup also ranged widely from \$50,000 to over \$60,000,000 for one very large and complex site. With the exception of the outlier, total cleanup of the case study properties had a mean average of about \$500,000 and a median of \$2,000,000.

#### **Brownfield Success Story: Port City, Portland**

The Port City site is a former battery recycling facility impacted by lead contaminants in the soil. The small 0.3 acre site was redeveloped into offices for the Port City Development Center, an organization which provides employment and other community development services. Financial assistance for site assessment and characterization was provided through the Portland Brownfield Program.

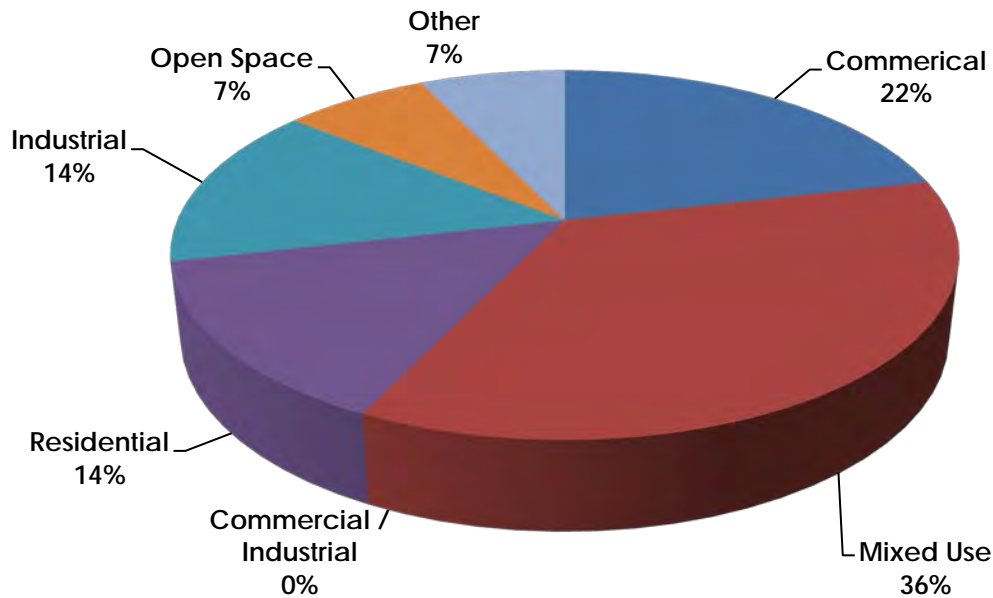


Remediation of the six gas station case study sites ranged from \$50,000 to \$1,200,000. Removing one outlier, cleanup costs for the gas station properties had a mean average of about \$315,000 and a median of \$400,000.

### 1.3.3 Redevelopment of Brownfields

Approximately half of the case study projects have successfully been redeveloped to a new use. The most common redevelopment uses were mixed use and commercial (See figure 2-2). It is important to note that over 50 percent of the redevelopment projects represent a change in use type and zoning. These use changes were predominantly from an industrial to a commercial or mixed use.

**Figure 2-2. Redevelopment Uses of Case Study Properties**



The change in use from industrial to commercial and mixed use appears to be a major factor in the financial feasibility of brownfield projects. Though sufficient data to conduct this analysis was limited to just four case study projects, the findings have important implications. The cost of cleanup exceeded the value of the land in its historical use by 13-192 percent in three of the case studies (See table 2-2). The cleanup cost was only 3 percent to 43 percent of the land value after redevelopment. The potential to generate sufficient value to offset the cost of remediation is fundamental to the financial feasibility of brownfield projects. The change of use appears to be a common and effective strategy that creates value and drives redevelopment of certain brownfields. This analysis underscores the reported difficulty of redeveloping industrial brownfields for continuing industrial use.

**Table 2-2. Remediation to Redeveloped Value**

Case Study Project	Cost of Environmental Cleanup as a Percentage of the Land Value Before Remediation	Cost of Environmental Cleanup as a Percentage of Land Value After Remediation and Redevelopment
1	67%	30%
4	36%	7%
6	13%	1%
7	134%	6%
8	162%	3%
9	192%	43%

In cases where change of use has been successful, the case study projects demonstrate the potential for brownfield redevelopment to drive employment growth. Job creation figures self-reported in the case study totaled over 10,000 jobs (both construction and permanent jobs). For individual brownfield sites, the responses ranged from 2 to 700 permanent new jobs per site (with greater numbers projected for the future on sites not yet fully built out). These numbers translate to an average of 23 jobs per acre and median of 10 jobs per acre. The job creation figures compare favorably with Oregon State Department of Land Conservation and Development estimates for commercial and light industrial employment density, of 12-20 and 10-15 jobs per acre, respectively.

### 1.3.4 Lessons Learned and Keys to Success

Several key themes emerged from interview and qualitative survey responses from the case studies regarding lessons learned and keys to success.

**Financing**—Cleanup and redevelopment projects require significant capital and the projects frequently hinge on access to financing. For the case studies, this often involved accessing public grants or loans, claims on historical insurance policies, or finding a commercial lender that was knowledgeable about brownfields. Difficulty securing financing was commonly cited as a limiting factor for projects.

**Coordination and Teamwork**—Several case studies point to the importance of the property seller, buyer, regulatory agency, and other stakeholders working together toward a common goal as key to success. This often included early involvement and understanding by the regulatory agency of financial limitations. In contrast, tension and disagreement between these parties was cited as reasons why projects were typically delayed.

**Land Use Transition**—Transition from industrial use to commercial or mixed use was fundamental to the financial success of many projects. The change in use drives a higher land value that can then offset the remediation costs. Maintaining historically industrial sites as a similar land use is a

challenge. Since industrial properties tend to have a constrained value per square foot, the financial gap between cleanup costs and redeveloped value can be significant. Therefore, the study takes a critical eye toward identifying solutions to address the need for maintaining industrial and employment lands in the region.

**Liability and Risk**—Defining the extent of contamination and remediation cost along with strategies to minimize risk was critical to the success of several projects. Risk management tools provided through the Voluntary Cleanup Program, Prospective Purchaser Agreements, and the willingness of the DEQ or Business Oregon to dedicate resources was key to the success of several case study projects

### **Brownfield Success Story: Troutdale Reynolds Industrial Park**

The Troutdale Industrial Park has been a huge success and nationally recognized for the collaboration between public and private partners. The property was formerly the site of an aluminum plant and was purchased by the Port of Portland via a Prospective Purchaser Agreement (PPA) with Oregon DEQ. The effort required the remediation of 700 acres of industrial property. Since its redevelopment, Fed Ex has established a warehouse onsite, becoming the first industrial tenant on the newly restored property, employing 800 workers. Once fully built out, the port estimates the project will yield nearly 3,500 jobs.

