Golder Associates Ltd. (Golder) completed an Aerial Assessment of Riparian Areas of the Vermilion River, AB and its Major Tributaries. The focus of the assessment was five-fold, including:

1) Delineation of lotic riparian areas and floodplains of the Vermilion River and riparian areas of its major tributaries.
2) Assessment of the condition of all riparian areas in the watershed using a rapid method or methods.
3) Identification of intact areas for conservation and/or protection.
4) Identification of degraded areas for restoration.
5) Prioritization of degraded areas for restoration.

Golder contracted Tarin Resource Services Ltd. (Tarin) from Calgary, Alberta to acquire digital stereo imagery and LiDAR data for the Vermilion River and identified tributaries. Digital, colour imagery was acquired on August 23rd and September 12th, 2015 for a 1 kilometer (km) wide corridor, centered on the following watercourses (Figure 1):

- Vermilion River
- Birch Creek
- Campbell Creek
- Cotton Creek
- Deer Creek
- Mundare Creek
- Irish Creek
- Marwayne Creek
- Stretton Creek
- Waskwei Creek
- Holden Drainage
- Holden Creek
- Lamont North Creek
- Warwick Creek
Figure 1: Flight Plan for Collection of Imagery
Over the last 100 years, the Vermilion River watershed has been extensively altered. There has been extensive drainage of wetlands to allow the expansion of agriculture, transportation and municipal and industrial development within the watershed. Some of the programs have been authorized by licenses, but other drainage projects have proceeded without proper authorization. The cumulative impact of drainage in the upper watershed may have increased the frequency and intensity of flooding in the middle reaches of the Vermilion River. Drainage may have also reduced the natural storage of water, thereby reducing the duration of water flow. Physical alteration of the Vermilion Lakes and the Vermilion River at Vegreville, and various water management structures, were constructed as flood management tools to reduce the impact of major summer rainfall events in the Vermilion Lakes basin. Substantial change in the vegetation types and extent from pre-European settlement were also summarized. The results of a landcover change analysis between 1990 and 2010 indicates that land-use change is still ongoing, and is driven primarily by an increase in the anthropogenic footprint and a corresponding decrease in forested and wetland landcover types.

Results from the aerial assessment and evaluation of riparian health showed that only 19% of the riparian areas within the Vermilion River watershed are in good condition, while 27% are in fair condition and 54% are in poor condition. The Vermilion River watershed results are similar to those found in the Battle River watershed, where the majority of the riparian areas assessed were scored as being in ‘poor’ health (Teichreb and Walker 2008). These results are likely not surprising, given the level of anthropogenic modification of riparian zones, in a largely agricultural setting. Overall the riparian health trend varies between drainages, with the Birch Creek drainage having the highest overall proportion of riparian areas with a ‘good’ health score of 57%, compared to the lowest ‘good’ health score of 8% in both the Holden and Lamont Creek Drainages. Results from the aerial assessment and evaluation of riparian health are presented in Table 1.

<table>
<thead>
<tr>
<th>Drainage</th>
<th>Good</th>
<th></th>
<th>Fair</th>
<th></th>
<th>Poor</th>
<th></th>
<th>Total Drainage Length (km)²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of</td>
<td>km²</td>
<td>% of</td>
<td>km²</td>
<td>% of</td>
<td>km²</td>
<td></td>
</tr>
<tr>
<td>Birch Creek</td>
<td>57</td>
<td>59</td>
<td>21</td>
<td>22</td>
<td>21</td>
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<td>103</td>
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<tr>
<td>Campbell Creek</td>
<td>29</td>
<td>7</td>
<td>29</td>
<td>7</td>
<td>42</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Cotton Creek</td>
<td>22</td>
<td>8</td>
<td>49</td>
<td>19</td>
<td>29</td>
<td>11</td>
<td>38</td>
</tr>
<tr>
<td>Deer Creek</td>
<td>35</td>
<td>21</td>
<td>14</td>
<td>8</td>
<td>51</td>
<td>30</td>
<td>59</td>
</tr>
<tr>
<td>Holden Creek</td>
<td>8</td>
<td>20</td>
<td>10</td>
<td>24</td>
<td>81</td>
<td>193</td>
<td>237</td>
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<tr>
<td>Irish Creek</td>
<td>43</td>
<td>42</td>
<td>25</td>
<td>24</td>
<td>33</td>
<td>32</td>
<td>97</td>
</tr>
</tbody>
</table>

*Project No: 1534932*
Notably, alteration of natural vegetation cover, represented by questions 1 through 3 of the assessment scorecard, largely contributed to most scores in the Vermilion River watershed. For most drainages and reaches, physical alteration of the riparian areas was not evident and resulted in a high score. Exceptions to this trend were observed within the Holden Creek and the Vermilion River drainages. This result is not a surprise, given the long history of wetland and agricultural drainage activities within the Holden Drainage District, and water control structures and altered channels along the Vermilion River itself. Limited areas of physically altered riparian zones were observed within most drainages, but most notably within Deer Creek.

The results of this aerial riparian health assessment cannot replace ground-based field assessments. The aerial assessment methodology does, however, provide a record of the current status of the riparian areas within an area, and can serve as a coarse-filter to evaluate large areas such as the Vermilion River watershed, to identify priority areas for further survey. The recommended methods for ground-based assessments would follow the Alberta Riparian Habitat Management Society, Riparian Health Assessment which has been extensively used in Alberta for over 20 years. Using the final health scores, preliminary drainages and reaches were identified and prioritized for either restoration or conservation management practices. Scores of ‘fair’ and ‘poor’ riparian health condition can identify areas for restoration opportunities, while areas of ‘good’ riparian health condition can be prioritized for conservation. Identifying landowners who are open and amenable to riparian conservation opportunities will be a key step in the process of implementing restoration and conservation practices. When appropriate, individual reach segments to be prioritized for conservation or restoration can be identified through review of the ArcGIS riparian health geodatabase.